

Med.
A

ANNALS OF SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE.

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ANNALS OF SURGERY.

THE EMPLOYMENT OF LOCAL ANÆSTHESIA IN
THE RADICAL CURE OF CERTAIN CASES OF
HERNIA, WITH A NOTE UPON THE NERVOUS
ANATOMY OF THE INGUINAL REGION.

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[From the Surgical Clinic of Professor Halsted.]

A BRIEF report was made before the Johns Hopkins Hospital Medical Society in May, 1898, on the propriety of using a local anæsthetic while operating upon certain cases of hernia, when the patient's age and physical condition seemed to prohibit general narcosis.

Since our first cocaine operation, December 6, 1897, to the present time, December 6, 1899, 233 herniotomies have been performed, forty-nine of them under regionary anæsthesia. These latter cases have been operated upon by Professor Halsted, Dr. Bloodgood, and the writer, and, for a variety of reasons, in the majority of them the administration of ether or chloroform seemed inadvisable or positively contraindicated, whereas, in the remainder, the local anæsthetic was employed at the patient's personal request.

Almost all cases of hernia, with the possible exception of those in young children, could undoubtedly be subjected to the radical operation under similar local methods, but when a general anæsthetic can safely be administered, for various reasons it is much to be preferred by both patient and operator. Under

local anæsthesia some pain is necessarily inflicted, and to spare the patient, it is a temptation to slight certain steps of an elaborate plastic operation. Furthermore, the operation necessarily consumes more time, and the responsibility of bolstering up the patient's courage is often most wearing on the surgeon. This, however, is not invariably the case, since personal inhibition towards pain varies so greatly with the individual. As Gottstein says, "*Die Schmerzempfindung bei verschiedenen Menschen verschieden ist,*" and many people readily submit to the slight immediate suffering incidental to operative procedures under local anæsthesia in preference to enduring the discomforts secondary to general narcosis. For those individuals who endure pain with but slight control, it is fortunate that there are certain adjuvants, such as the preliminary administration of morphia and occasional inhalations of chloroform during the operation, which may render the objections to the local method less valid, but, nevertheless, the anæsthesia of choice will continue to be a general and not a local one.¹

In certain conditions, however, complete narcosis is contraindicated, and it is my object to report the results of our observations upon cases which have been operated upon under these circumstances.

Advanced age, chronic bronchitis and emphysema, tuberculosis laryngeal or pulmonary, cardiovascular changes of

¹ Since this paragraph was written observations upon the nervous anatomy of the inguinal region, reviewed in the latter part of this paper, have so greatly assisted us in the performance of a painless operation that the above statements may be qualified to a considerable degree. During the fall of 1899, twenty-four herniotomies with cocaine or eucaïne β have been performed in young men practically without pain, and this procedure has become so popularized in the ward where our hernia cases are admitted that the operation under the local anæsthetic has become the operation of choice. An individual awaiting operation needs to remain in the ward only long enough to compare the convalescence of an ether case and that of one done under cocaine to choose the latter method for himself. These patients usually regard the shaving and skin preparation as the most trying part of the operation. Most of the observations on cutaneous anæsthesia have been made on these cases during the operation and immediately after closing the wound. It has been found that the patient can assist not a little in certain steps of the operation, as, for example, when the neck of the sac is closed, in making negative abdominal pressure to prevent the omentum, or bowel, from being pushed down between the peritoneal sutures.

marked degree, chronic nephritis, and, above all, the shock and vomiting in strangulation have been factors in the selection of these cases. One of Dr. Bloodgood's patients was eighty-four years of age, and operative intervention for his large uncontrollable hernia had been refused him several times. In another case the local anæsthetic was chosen because a previous administration of ether for the purpose of operating on a suppurative ethmoiditis had almost resulted in a death on the table. Another case was that of a sickly child with bronchopneumonia and an incarcerated congenital hernia; another, a case with tuberculous laryngitis. Other specific illustrations might be given, but, as will be seen on consulting the appended table, the two conditions which have been chiefly responsible for the avoidance of inhalation methods of anæsthesia have been (1) the combination of arteriosclerosis with cough from chronic bronchitis and emphysema in patients past middle life, and (2) the shock and vomiting associated with strangulation.

During the past eighteen months, in Dr. Halsted's house-service, about 200 cocaine operations have been registered, many of them major operations, and often upon patients to whom, for reasons similar to those reviewed above, it seemed unwise to administer ether or chloroform. About thirty laparotomies have thus been performed under local anæsthesia; several exploratory sections; two gastrostomies by the Ssabanejew-Frank method; closure of a traumatic rupture of the jejunum; three cholecystostomies for empyema of the gall-bladder; three appendectomies, one acute case in a patient with extensive bronchiectasis and osteo-arthritis, a second, an "interval" operation through a McBurney incision in a young man with tuberculous laryngitis, and the third case, the removal of a chronic appendix, with adhesions, which had given abdominal symptoms, supposed to be perforative, in a patient with typhoid fever. On September 7, of this year, the writer, under cocaine anæsthesia, operated and closed one perforation of the ileum in a typhoid case, and inverted two other suspiciously thin Peyer's patches. I succeeded without difficulty in resecting a pylorus for carcinoma in an old woman who had a large cavity in one lung, and again, in doing a gastro-enterostomy, by a

method similar to Roux's, which required a double suture. It is extraordinary that handling, resecting, and suturing the bowel should be unattended by pain. Lilienthal has called attention to this. The same may be said of the omentum. In one herniotomy a large mass, the size of two fists, was excised without pain. Cocainization of the gut has never been necessary. Any attempt to drag upon the bowel, however, does cause pain similar in character to that of peristaltic cramp. This has been observed several times in handling strangulated loops, and in one of the appendectomies referred to, while lifting up the organ to free it from the surrounding adhesions, pain, referred to the epigastrium and resembling the patient's previous attacks of appendicular colic, was occasioned. Amputation of the appendix, however, has always been painless.

A great number of minor operations are, of course, readily performed under local anæsthesia, and it is consequently very largely employed in out-patient clinics. In dealing with the large group of thyroid enlargements and growths in the neck, in which there is any tracheal compression, Kocher has demonstrated cocaine to be almost a *sine qua non* of operation. Local anæsthesia is especially suitable for such operations as the ligation of varicose veins, suprapubic cystostomies, even in patients who might safely take an anæsthetic, and all scrotal operations, as for varicocele, hydrocele, castration, etc., are simply performed through the high incision which is employed at this hospital, provided the ileo-inguinal nerve is previously cocainized in the canal. This will be dwelt upon later.

It is the writer's intention, however, to confine himself chiefly to the hernia group of cases, and accordingly they have been tabulated, with some of the most important data relating thereto.

TABLE OF HERNIOTOMIES PERFORMED UNDER LOCAL ANÆSTHESIA BY
COCAINE.

(In this list those cases alone are included in which a general anæsthetic, for the reasons given in the table, seemed contraindicated. The twenty-four cases in which cocaine was simply the anæsthetic of the patient's selection are not included.)

CASE I.—Surgical No. 7196, December 6, 1897, Cushing. Age. fifty-

three years, male. *Character of hernia*, large left inguinal; strangulated forty-eight hours; viable bowel. *Reason for selection of local anæsthetic*, arteriosclerosis; shock and vomiting of ileus. *Character of operation*, simple relief of strangulation with reduction; closure (radical cure at a later date). *Complications*, none. *Result*, healing *per primam*; well.

CASE II.—Surgical No. 7623, April 21, 1898, Cushing. *Age*, sixty-seven years, male. *Character of hernia*, large right inguinal; recently incarcerated. *Reason for selection of local anæsthetic*, chronic bronchitis and emphysema; arteriosclerosis (extreme); chronic nephritis. *Character of operation*, radical cure; simple closure of abdominal wall after section of spermatic cord. *Complications*, none. *Result*, healing *per primam*; well.

CASE III.—Surgical No. 7652, April 27, 1898, Cushing. *Age*, thirty-nine years, male. *Character of hernia*, large left inguinal; strangulated six hours; bowel viable. *Reason for selection of local anæsthetic*, frequent vomiting of ileus; shock. *Character of operation*, radical cure; section of spermatic cord, as testicle was atrophied. *Complications*, some swelling of testicle. *Result*, healing *per primam*; well.

CASE IV.—Patient of Dr. Gaver, May 1, 1898, Cushing. *Age*, fifty years, female. *Character of hernia*, small right femoral; strangulated three days; bowel viable. *Reason for selection of local anæsthetic*, no assistant. *Character of operation*, radical cure. *Complications*, none. *Result*, healing *per primam*; well.

CASE V.—Surgical No. 7769, June 8, 1898, Bloodgood. *Age*, sixty-seven years, male. *Character of hernia*, small left inguinal. *Reason for selection of local anæsthetic*, age and chronic nephritis. *Character of operation*, radical cure; section of cord; transplantation of rectus muscle. *Complications*, some swelling of testicle; hæmatoma. *Result*, well.

CASE VI.—Surgical No. 7777, June 8, 1898, Bloodgood. *Age*, fifty years, female. *Character of hernia*, small right femoral; strangulated; bowel viable. *Reason for selection of local anæsthetic*, frequent vomiting. *Character of operation*, radical cure. *Complications*, none. *Result*, healing *per primam*; well.

CASE VII.—Surgical No. 7804, June 13, 1898, Bloodgood. *Age*, fifty-two years, female. *Character of hernia*, large umbilical; symptoms of strangulation, four days; bowel viable. *Reason for selection of local anæsthetic*, obesity; frequent vomiting. *Character of operation*, radical cure; wound drained. *Complications*, continuance of vomiting; diarrhœa, etc. *Result*, healing *per primam* and *per sec.*; well.

CASE VIII.—Surgical No. 7861, July 6, 1898, Bloodgood. *Age*, eighty-three years, male. *Character of hernia*, very large right inguinal. *Reason for selection of local anæsthetic*, age; arteriosclerosis; aortic insufficiency. *Character of operation*, radical cure, with rectus transplantation; castration. *Complications*, none; catheterized once. *Result*, healing *per primam*; well.

CASE IX.—Surgical No. 8102, September 11, 1898, Cushing. *Age*, sixty-five years, male (colored). *Character of hernia*, small right inguinal;

strangulated ten hours; bowel viable. *Reason for selection of local anæsthetic*, condition good; might have had general anæsthesia. *Character of operation*, radical cure; Bassini's operation. *Complications*, none. *Result*, healing *per primam*; well.

CASE X.—Surgical No. 8269 (cf. 7861), October 25, 1898, Bloodgood. *Age*, eighty-four years, male. *Character of hernia*, small left inguinal. *Reason for selection of local anæsthetic*, age; arteriosclerosis, etc. *Character of operation*, radical cure; simple closure after excision of sac and section of cord. *Complications*, none. *Result*, healing *per primam*; well.

CASE XI.—Surgical No. 8392, December 2, 1898, Bloodgood. *Age*, sixty-two years, male. *Character of hernia*, large right inguinal. *Reason for selection of local anæsthetic*, shock of ileus; vomiting. *Character of operation*, simple relief of strangulation; suspicious gut left in wound. *Complications and result*, death from pneumonia, following chloroform administration, the following day, given during resection of suspicious bowel.

CASE XII.—Surgical No. 8445, December 28, 1898, Cushing (cf. reported in full). *Age*, seventy-one years, male. *Character of hernia*, large right inguinal. *Reason for selection of local anæsthetic*, chronic bronchitis with emphysema; cardiac hypertrophy; arteriosclerosis; alcoholism. *Character of operation*, radical cure; simple closure after excision of sac and section of cord. *Complications*, pleurisy; cardiac insufficiency temporary; considerable abdominal distention. *Result*, healing *per primam*; well.

CASE XIII.—Surgical No. 8445, January 30, 1899, Cushing. *Age*, seventy-one years, male. *Character of hernia*, large left inguinal. *Reason for selection of local anæsthetic* (given above, Case XII). *Character of operation*, radical cure; simple closure after excision of sac and section of cord; transplantation of rectus. *Complications*, none. *Result*, healing *per primam*; well.

CASE XIV.—Surgical No. 8511, January 12, 1898, Cushing. *Age*, fifty years, male. *Character of hernia*, large direct inguinal. *Reason for selection of local anæsthetic*, chronic bronchitis and emphysema; myocarditis. *Character of operation*, radical cure; Halsted's operation; a few whiffs of chloroform necessary for closure. *Complications*, none; catheterization required twice. *Result*, healing *per primam*; well.

CASE XV.—Surgical No. 8591, February 1, 1899, Professor Halsted. *Age*, seventy-two years, male. *Character of hernia*, small right inguinal. *Reason for selection of local anæsthetic*, arteriosclerosis. *Character of operation*, radical cure; transplantation of rectus. *Complications*, abdominal distention and pain for some days, probably from preliminary morphia. *Result*, healing *per primam*; well.

CASE XVI.—Surgical No. 8619, February 15, 1899, Cushing. *Age*, sixty-eight years, male. *Character of hernia*, large right femoral. *Reason for selection of local anæsthetic*, chronic suppuration of ethmoid cells; had previously nearly succumbed to ether. *Character of operation*, radical cure;

Halsted's method by granulation. *Complications*, none; catheterization necessary during recumbency; hypertrophied prostate. *Result*, healing by granulation; well.

CASE XVII.—Surgical No. 8630, February 6, 1899, Cushing. *Age*, fifty-nine years, female. *Character of hernia*, small left femoral; incarcerated ten days; bowel viable. *Reason for selection of local anæsthetic*, extreme prostration. *Character of operation*, radical cure. *Complications and result*, death on second day; continuance of prostration; subnormal temperature.

CASE XVIII.—Surgical No. 8726, March 7, 1899, Cushing. *Age*, three and one-half months, male. *Character of hernia*, right congenital; strangulated; viable. *Reasons for selection of local anæsthetic*, double broncho-pneumonia. *Character of operation*, radical cure. *Complications and result*, death on second day; broncho-pneumonia antedating operation. *Autopsy*.

CASE XIX.—Surgical No. 9081, June 18, 1899, Cushing. *Age*, sixty-eight years, male. *Character of hernia*, large right inguinal, with hydrocele. *Reason for selection of local anæsthetic*, chronic bronchitis. *Character of operation*, radical cure; simple closure after excision of sac and section of cord; excision of hydrocele. *Complications*, none. *Result*, healing *per primam*; well.

CASE XX.—Surgical No. 8754, March 21, 1899, Cushing. *Age*, seventy-six years, male. *Character of hernia*, small right inguinal; strangulated four days; gangrenous. *Reason for selection of local anæsthetic*, pronounced shock and vomiting; bronchitis; chronic nephritis; arteriosclerosis; stercoraceous vomiting. *Character of operation*, simple relief of constriction; establishment of artificial anus. *Complications and result*, resection of bowel and end-to-end suture, under cocaine, on second day; death from broncho pneumonia sixth day. *Autopsy*, peritoneum sterile; suture intact.

CASE XXI.—Surgical No. 9228, July 28, 1899, Cushing. *Age*, fifty-eight years, male. *Character of hernia*, very large left inguinal. *Reason for selection of local anæsthetic*, chronic bronchitis and emphysema; arteriosclerosis; alcoholism. *Character of operation*, radical cure; simple closure after excision of sac and castration. *Complications*, none. *Result*, healing *per primam*; well.

CASE XXII.—Patient of Dr. Ellis, August 3, 1899, Cushing. *Age*, fifty-five years, female. *Character of hernia*, small right femoral; strangulated three days; gangrenous. *Reason for selection of local anæsthetic*, prostration; vomiting. *Character of operation*, excision of gangrenous area; establishment of artificial anus; subsequently admitted to house for operation. *Complications*, none. *Result*, August 24, 1899, resection of bowel; lateral anastomosis; peritoneal closure without drainage; recovery.

CASE XXIII.—Surgical No. 9274, August 5, 1899, Cushing. *Age*, forty-five years, male. *Character of hernia*, large right inguinal; strangulated three days; viable. *Reason for selection of local anæsthetic*, pronounced shock; hiccough and vomiting; arteriosclerosis. *Character of operation*, relief of constriction; reduction of dark suspicious bowel (free fluid in sac contain-

ing colon bacilli); division at neck of sac and closure of peritoneal cuff; rest of wound left open. *Complications*, none. *Result*, radical cure ten days later, by Dr. Mitchell; ether anæsthesia; closure; healing *per primam*; well.

CASE XXIV.—Surgical No. 9182, July 15, 1899, Cushing. *Age*, seventy-one years, male. *Character of hernia*, large right inguinal. *Reason for selection of local anæsthetic*, age; arteriosclerosis; chronic bronchitis and emphysema. *Character of operation*, radical cure; simple closure of abdominal wall after division of cord, with transplantation of rectus muscle. *Complications and result*, slight swelling of testicle; healing *per primam*; well.

CASE XXV.—Surgical No. 9323, August 24, 1899, Cushing. *Age*, sixty years, male. *Character of hernia*, small right inguinal, with large hydrocele. *Reason for selection of local anæsthetic*, age; arteriosclerosis. *Character of operation*, radical cure; simple closure of abdominal wall after removal of hydrocele and castration. *Complications*, none. *Result*, healing *per primam*; well.

CASE XXVI.—Surgical No. —, September 16, 1899, Cushing. *Age*, forty-eight years, male. *Character of hernia*, large right inguinal. *Reason for selection of local anæsthetic*, obesity; fatty heart. *Character of operation*, radical cure; simple closure after division of cord; difficult operation from fat tissue. *Complications*, none. *Result*, healing by primary union; superficial fat necrosis threatened; wound did not open, though line of incision discolored; well.

CASE XXVII.—Surgical No. 9447, September 26, 1899, Cushing. *Age*, fifty-three years, male. *Character of hernia*, very large right inguinal. *Reason for selection of local anæsthetic*, bronchitis and emphysema; arteriosclerosis. *Character of operation*, radical cure; closure with transplantation of rectus muscle after division of cord. *Complications*, none. *Result*, healing *per primam*; well.

CASE XXVIII.—Surgical No. —, September 30, 1899, Cushing. *Age*, thirty-three years, female. *Character of hernia*, strangulated right femoral, two days; bowel viable. *Reason for selection of local anæsthetic*, prostration. *Character of operation*, simple reduction of strangulated gut; no attempt at closure; gauze pack. *Complications*, none. *Result*, healing by granulation; well.

CASE XXIX.—Surgical No. 9531, October 30, 1899, Mitchell. *Age*, seventy-five years, male. *Character of hernia*, large right inguinal with hydrocele; strangulated six hours; bowel viable. *Reason for selection of local anæsthetic*, age and strangulation. *Character of operation*, radical cure, with castration. *Complications*, none. *Result*, healing *per primam*; well.

CASE XXX.—Surgical No. 9523, October 27, 1899, Mitchell. *Age*, seventeen years, male. *Character of hernia*, congenital right inguinal, with undescended testicle; strangulated twelve hours; bowel viable. *Reason for selection of local anæsthetic*, shock, vomiting, leucocytosis of 43,000. *Character of operation*, radical cure, with transplantation of testicle. *Complications*, none. *Result*, healing *per primam*; well.

Many of the cases included in this table represent patients who would have been refused operation a few years ago. In his report on hernia, Bloodgood says (*The Johns Hopkins Hospital Reports*, Vol. vii, p. 334), relative to the days before we began the use of local anæsthesia, "In patients over fifty years of age, suffering from non-strangulated hernia, we have selected our cases because of the possible danger from the anæsthetic." Bull and Coley likewise regard sixty years of age as a contra-indication for the operation (*ANNALS OF SURGERY*, 1898, p. 598). The preceding table shows that under local anæsthesia, in the past few months, there have been fourteen patients over sixty years of age who have been operated upon not for emergency reasons, but from choice.

The citation of a few particular illustrations in greater detail will, perhaps, better elucidate the reasons for avoidance of general anæsthesia upon which we have just generalized. These cases naturally fall into two groups: (1) those in which the operation is not absolutely necessary, but done on account of the annoyance of the hernia; and (2) the cases of strangulation in which there is urgent demand for intervention. The femoral operation and that in women offers so little difficulty under a local anæsthetic that I will dwell only upon the more difficult conditions occurring in the male. Nos. XII and XIII of the table represent the type of combination of advancing age, cardiovascular changes, chronic bronchitis, and an associated annoying rupture. The case is as follows:

CASE.—Edward I., aged seventy-one years, an attorney, had suffered from a double inguinal hernia for forty years. It had always given him considerable pain, and at times had incapacitated him from the practice of his profession. He had worn a double truss for years, but it rarely controlled the ruptures for more than a few hours at a time. He suffered greatly from chronic constipation, aggravated by his inability to strain at stool, and on several occasions, during the past few years, one of the hernias had become incarcerated. The patient had for years used alcohol to excess.

Physical examination showed an old man with evidences of chronic alcoholism. His skin was loose, with panniculus abundant, and the tissues generally were very flabby. There was marked pul-

monary emphysema, sufficient to obliterate the area of cardiac dullness, and over the præcordia a harsh systolic murmur could everywhere be heard. The radial pulse was small and difficult to palpate. The abdominal walls were very lax (cf. Fig. 1), and even in recumbency the least movement caused the large bilateral inguinal hernias to protrude after they were once reduced.

A note on the local condition reads as follows: "Both hernias are complete and descend to the bottom of the scrotum, twenty centimetres below the external rings. During their protrusion the scrotum measures thirty-seven centimetres in circumference. The hernia on the right, the larger, attains the size of an infant's head. It contains bowel which is easily reducible. The external ring readily admits the tips of two fingers. The pillars are strong; they close somewhat when the patient's head is raised from the bed, and there is present a well-marked conjoined tendon.

"On the left, the sac also contains bowel, which feels doughy, and is reduced with a little more difficulty. (This proved subsequently to be a large coil of sigmoid flexure full of fæces, evidently a large factor in his chronic constipation.) The external ring is large, readily admits the tips of three fingers, which pass directly through the parietes over the brim of the pelvis. The ring shows no tendency to close when the patient raises his head, and there is no evidence of a conjoined tendon. The testicle may readily be reduced, together with the sac and its contents, through this opening in the parietes."

These hernias were operated upon, one at a time, with a month's interval, as follows:

Right hernia, December 28, 1898: Radical operation under cocaine anæsthesia with preliminary one-eighth grain of morphia. The usual high incision was made through the fat abdominal wall down to the aponeurosis, which was split outward from the ring to expose the internal oblique muscle. This was flabby and pale, and was not incised as under ordinary circumstances. After cocainization of the nerves the sac was exposed, divided at its neck, and the large peritoneal opening having been closed, the fundus of the sac was stripped from the scrotum as usual. Considering the patient's age and the need of a strong parietes rather than an intact vas deferens, the cord was divided and the abdominal wall closed without Bloodgood's transplantation of the rectus, since there was a firm conjoined tendon to protect the lower angle. Although the patient had had a preliminary training in recumbency before the operation, he bore his early enforced rest in bed badly. Some evidence of hypostasis in

both lungs followed. He developed a pleuritic friction-rub, and there was for a time some evidence of loss of cardiac compensation. Doubtless a general anæsthetic would have been the extra straw in



FIG. 1.—Three weeks after operation on right side. Showing relaxed abdominal walls and descended left inguinal hernia.

producing serious pulmonary complications. The wound healed by primary union. Fig. 1 shows his condition twenty-one days after this first operation.

Left hernia, January 30, 1899: Radical operation under Schleich's infiltration anæsthesia after preliminary administration of morphia. This hernia presented much greater difficulties than the preceding



FIG. 2.—Three weeks after operation on left side.

one, but the patient stood the operation without evidence of suffering, and the convalescence was easy and uninterrupted by complications. The internal oblique muscle was incised, exposing the neck of the

sac, which was very large, its posterior wall being composed of sigmoid flexure, which had prolapsed into the scrotum. The bowel was reduced, the sac divided at its neck, the peritoneal opening closed, and the large scrotal portion of sac was then painlessly excised. The absence of conjoined tendon rendered advisable the transplantation of the rectus muscle on Bloodgood's principle to strengthen the

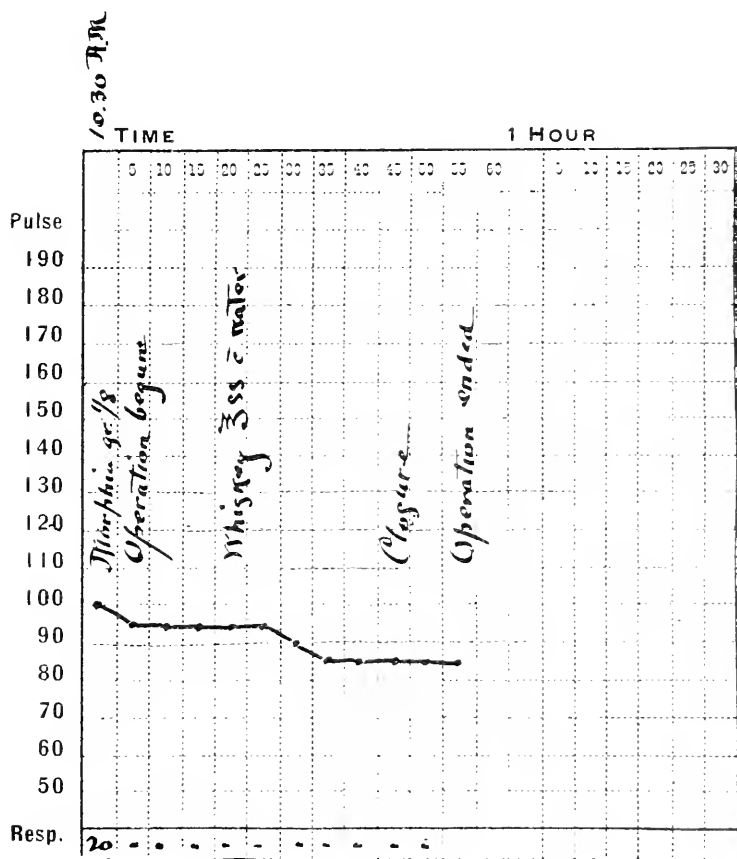


FIG. 3.—Anesthesia chart of operation in Case No. 8445.

lower angle of the wound. The parietes were closed tight after division of the spermatic cord. The wound healed by primary union. Fig. 2 shows the condition of the abdominal wall three weeks after this second operation.

The relief gained by the operation, as in all such cases in old

people, was extraordinary. The freedom from constipation, which had been resultant to the impaction of fæces in the prolapsed sigmoid and to the inefficacy of the abdominal muscles as an aid to evacua-



FIG. 4.—Case XXI. Before operation. Showing the large descended left inguinal and undescended right direct inguinal hernia.

tion, was immediate, and perhaps is one of the greatest gains in comfort following such large herniotomies in old people.

The accompanying anæsthesia chart of a plotted five-minute

pulse-rate shows how little effect the operation had upon the cardiac action. (Fig. 3.)

CASE XXI.—Large, completely descended left inguinal hernia. Large, undescended right direct inguinal hernia. (Fig. 4.) Mention is made of this case on account of the large size of the hernia, which hung half-way to the patient's knees, and measured fifty-one centimetres in circumference, and on account of the painlessness of the operation. As will be pointed out later, there is great variation in

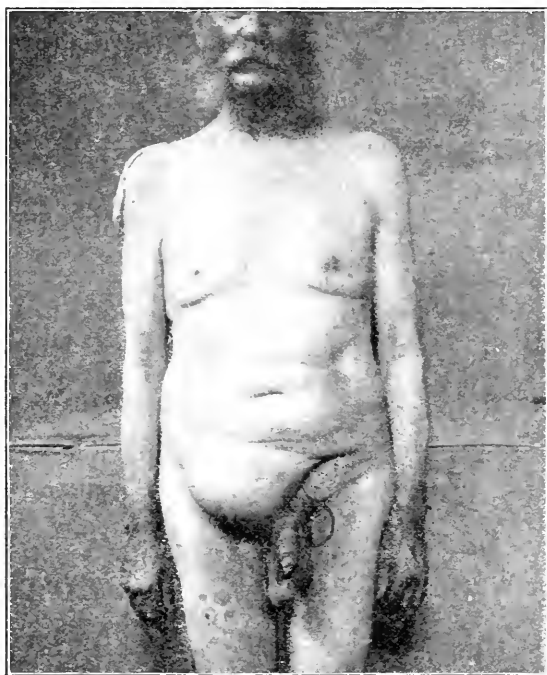


FIG. 5.—After operation on left inguinal hernia, showing area of subsequent anæsthesia.

the distribution of the nerves supplying the inguino-scrotal region, and the anastomoses may be sufficiently free to embarrass the operator even after cocainization of the main sources of supply. In this particular case, after cocainization of the ileo-inguinal alone, as it lay in the canal (cf. Fig. 12), no further pain was experienced by the patient, except at the lower part of the scrotum, when the testicle, which was removed, was freed from the blood-supply at its lower pole, in which

situation evidently unanæsthetized filaments of the internal pudic were encountered. Castration and transplantation of the rectus were performed and the parietes closed. In this case simple division of one nerve-trunk, therefore, anæsthetized the entire deep operative field. That this trunk was a combined one is shown in Fig. 5, which gives the area of subsequent cutaneous anæsthesia (ileo-inguinal and genital branch of the genito-crural) resultant to the operation.

The hernia on the right gave the patient no discomfort; it was controlled by a truss, and was not operated upon.

THE OPERATION IN STRANGULATION.

For cases of strangulation local anæsthesia is especially adapted. It is difficult or impossible to foretell the condition of the imprisoned bowel, and though the results in the viable cases are always successful, provided the patient escapes post-anæsthetization sequelæ (unfortunately not an infrequent complication), the mortality of those cases in which the gut is found to have lost its viability has always been high. It is in the experience of many to have seen such cases die under a general anæsthetic on the operating-table. The extreme degree of toxicity of the contents of the proximal bowel, especially when the strangulation is low, is such that patients, apparently in good condition, may succumb to an autoinfection even after relief of the strangulation. This is so well recognized that Kocher (*British Medical Journal*, October 29, 1898), Whiteford (*British Medical Journal*, April 29, 1899), and others have advocated the opening of the intestine above the constriction for the purpose of evacuating its contents, and observance of this principle might have saved Case XVII of our cocaine series. The immense amount of stinking fluid which escapes under such circumstances is familiar to all operators, and the observations of de Klecki, Sanarelli, and Dreyfuss have shown that normal intestinal bacilli may attain great virulence under such conditions. In Case XXII of my series 1200 cubic centimetres of dark, foul-smelling fluid were siphoned off with a rubber tube after the bowel was opened. The colon bacillus, cultivated from this fluid, produced an excessive amount of indol and possessed marked pathogenicity. It is in such cases as these that general narcosis,

even leaving aside the dangers of inhalation pneumonia, since constant vomiting usually is an accompaniment of these conditions, should be avoided, as it is often the additional burden which prevents recovery. This is as true of the cases in which the bowel is viable as of those with a gangrenous loop.

The patient's apparent state often belies the condition of the constricted bowel. It is not uncommon to have an individual walk into the hospital with a strangulated gut which has lost its viability. On the other hand, an imprisoned but viable loop may have caused intense shock and prostration.

It is for such reasons that exploration under regionary anæsthesia is demanded, and I can only emphasize the stress laid in a former report upon this point.

Under a local anæsthetic without danger to the patient the sac may be exposed, the constriction relieved, the gut, if viable, reduced, and, depending entirely upon the patient's condition, a radical cure may be completed at the same time or at a later date, when general narcosis, if desirable, may be employed. If the gut is not viable, experience has demonstrated that the immediate establishment of an intestinal fistula is much the safest procedure, as this permits the immediate escape of the retained toxic products from the proximal bowel. This is readily accomplished under the local anæsthetic, and at a later date, when the patient has fully recovered, the intestinal suture may be performed with much less risk.

All of these points are fairly well illustrated by cases of strangulation in our series. Under some circumstances (Cases III, IV, VI, VII, IX, XVIII, and XXIX) it has been possible to complete a radical cure at the first operation. On other occasions (Cases I, XI, XX, XXII, XXIII, and XXVIII) the patient's condition would not allow of this, and a radical operation, with or without general narcosis, has been performed at a later date. In Case XXIII, a large loop, presumably of ileum, was found, deeply congested and with a dull serosa. The sac was distended with bloody fluid, which contained many bacilli on cover-slip preparation (subsequent cultivation showed bacilli coli communis). With some hesitation the

gut was returned and the peritoneum closed. The rest of the wound was left open, in anticipation of a possible infection, which, however, did not follow, and Dr. Mitchell, ten days later, performed a radical operation under ether anæsthesia. This is the first case of strangulation in this hospital, I believe, in which the bowel has proved to be viable and yet has allowed of the migration of intestinal organisms. The fluid contents of the sac from all of our cases, except the gangrenous ones, has heretofore proved to be sterile, which corresponds with the experience of German writers.

The cases with gangrenous bowel present a more difficult problem. With only two or three exceptions, at this hospital, such conditions have led to a fatal termination. On one occasion Dr. Bloodgood resected and sutured a gangrenous bowel in a young man under general narcosis, with recovery. Case XXII of the above cocaine series also recovered after a resection. The other cases have succumbed, if not directly to the anæsthetic, soon afterwards, and often from pulmonary complications. Case XX of the table shows that there is a predisposition to pulmonary disturbance, even when inhalation anæsthesia has not been employed, and the effects of ether or chloroform furnish an additional burden, which is more than can be carried. Occasions doubtless arise when an immediate anastomosis can be made, but under ordinary circumstances I believe it is preferable, as stated above, to establish an artificial anus, and allow all of the contents of the upper bowel to become rapidly evacuated. Immediate improvement follows such a measure. A secondary operation, with intestinal anastomosis, may be required at an early date, provided the fistula is a high jejunal one. If, on the other hand, it is low, the secondary suture may be indefinitely postponed. This question of high fistulæ is illustrated by the following case:

CASE XXII.—The patient, Mrs. H., aged fifty-five years, was seen August 3, 1899, suffering from a strangulated right inguinal hernia of three days' duration. Her condition was poor, vomiting was stercoraceous and frequent, and an immediate operation under local anæsthesia was performed. A gangrenous loop of bowel was found, which was excised, and an immediate fistula established. It

was feared at the time that the fistula might be high, as there was but little abdominal distention despite the duration of the obstruction. From the upper bowel a large amount (1200 cubic centimetres) of foul-smelling, dark fluid, of the same character as the vomitus, was siphoned off through a rubber tube, and the bowel thoroughly irrigated with salt solution. Relief was immediate and vomiting ceased. Unfortunately the seat of strangulation was high, possibly mid-jejunal, and it was found that all ingesta would appear in a very short time at the established fistula, having undergone but little if any absorption. In a few days the skin became deeply eroded and exceedingly sensitive over the whole right side. Feeding by the distal loop, from some mechanical twist of the bowel, was found to be impossible, and the rectum soon rebelled against nutritive enemata. Such a combination of circumstances was most serious, and the patient emaciated rapidly. With some difficulty she was persuaded to enter the hospital, where she was put in a constant bath, and under water the dermatitis rapidly cleared up. Four days later she was operated upon; a lateral anastomosis and suture, without mechanical aid, was made, the fistulous end of the bowel removed, and the wound closed. She made an uneventful recovery.

An important step preliminary to the operation was taken; a procedure, the value of which has been emphasized heretofore by the writer. For two days before the operation every precaution was taken to prevent the entrance of micro-organisms into the stomach; the mouth was cleansed and all ingesta sterilized. The accompanying figures (Fig. 6, *a*, *b*, and *c*) show graphically the result,—viz., three Petri dishes, which were, upon different occasions, inoculated with one platinum loop full of the contents of the discharging fistula. *A* represents the inoculation at entrance; *b*, on the second day after sterile diet; and *c* was made from the contents of the bowel at the time of suture. The bacteriological questions involved will be discussed in another paper, but any comparison between the probabilities of a successful suture at the time of the first inoculation, when the lumen was teeming with micro-organisms, and at the last, with a practically sterile bowel, is not to be made.

Needless to say, such a successful result will not always follow, and the diminished resistance of the patient, who has been prostrated by the shock and subsequent toxæmia of

strangulation, is often provocative of pulmonary complications, which inhalation narcosis would insure, and operative relief,



FIG. 6 (a).—August 19, 1899 Culture from discharging fistula. No dietary precautions.



FIG. 6 (b).—August 21, 1899. After twelve hours of sterile diet.

even under local anæsthesia, comes too late to ward off. For example, in Case XX, a man, aged seventy-six years, presented

a gangrenous strangulation of four days' duration. On March 21, 1899, a fistula was established under cocaine anæsthesia, through misguided judgment, without complete excision of all of the gangrenous loop of bowel, though it was left out of the abdomen. The patient was *in extremis* at the time of operation, with evidences of hypostasis. By the second day the proximal bowel had emptied itself, and he had improved sufficiently to make me think it advisable to remove the remaining portions of the necrotic intestine. This was done under local anæsthesia, and gave so little discomfort that the opening into the abdomen



FIG. 6 (c).—At operation and suture, August 24, 1899. After four days of sterile diet and an eight hours' fast.

was enlarged, the ends of the bowel lifted out, and sutured by an end-to-end anastomosis over a Halsted bag. The suture was dropped and the peritoneum closed. The patient died on the sixth day. At the autopsy Dr. MacCallum found a condition of extensive broncho-pneumonia. Cultures from the peritoneal cavity were sterile. The suture was intact.

It is in border-line cases of this sort that local anæsthesia gives the best chance of recovery. In just such cases as the one related above do we often meet with death under, or rapidly following, the general anæsthetic.

OBSERVATIONS FROM COCAINE OPERATIONS UPON THE NEURAL ANATOMY OF THE HERNIAL REGION.

The application of an anatomical familiarity with the peripheral distribution of the spinal nerves, which, under the influence of general anæsthetics has fallen into abeyance, becomes once more of interest and importance to the surgeon in extensive operations under local anæsthesia. Furthermore, no condition has ever afforded similar opportunities for the accurate investigation of the sensory distribution of these nerves, since methods of dissection are necessarily gross, and physiological experiments upon animals naturally present variations from the human type.

The principles of cocainization of main trunks of nerves, introduced by Corning in 1885, have since been utilized in operations on the extremities for minor and even major amputations, for the anæsthetization of areas preliminary to the removal of skin-grafts¹ and like procedures, but I am unaware that heretofore similar methods have been made use of in operations on the trunk. To insure success in any major operation attempted under local anæsthesia, an accurate knowledge of the course and situation of the nerves likely to be encountered is most essential, since the accidental division of an unexpected sensory nerve-trunk is often sufficient to overcome whatever preliminary inhibition to pain the patient may have had, and thus to make recourse to complete narcosis necessary in cases where it should, perhaps, be specially avoided. In my earlier hernia operations I frequently inflicted pain where now none is occasioned, owing to greater familiarity with the course and distribution of the nerves concerned.

In the accompanying sketch (Fig. 7) an attempt has been made to show diagrammatically the usual cutaneous distribution of the inguino-scrotal nerves as well as the deeper situation of the main trunks. Through the kindness of Dr. Bardeen I have been able to compare with my results a great number of sketches made in the anatomical department for an unpublished

¹ Cocainization of the anterior crural, below Poupart's, for the removal of large Thiersch grafts from the front of the thigh, was introduced at this hospital by Dr. Young.

report on the peripheral nervous system, and though there is considerable variation in the situation and anastomoses of the particular nerves of this region, as may be seen by consulting

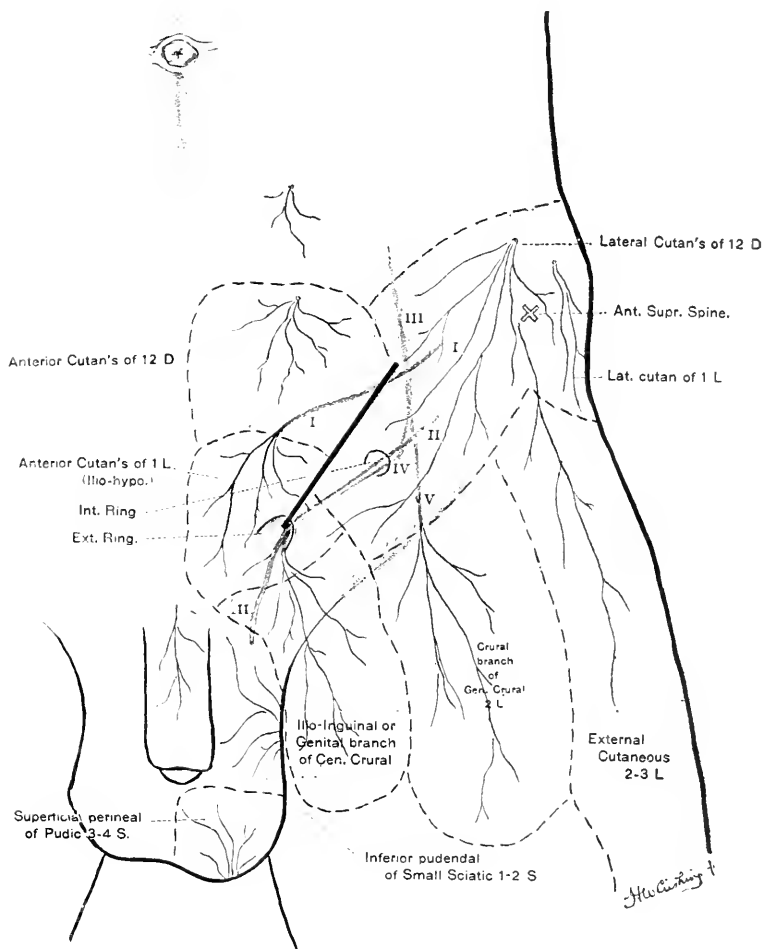


FIG. 7.—Showing inguino-scrotal nerves, their peripheral distribution, and relation of the main trunks to the hernia incision. I. Ilio-hypogastric; II. Ilio-inguinal; III. Genito-crural; IV. Genital branch; V. Crural branch.

Griffin's article (*Journal of Anatomy and Physiology*, 1891), we have taken what may represent the average.

Superficial Nerves encountered by the Incision.—The skin

incision, as ordinarily made, passes in a line which separates the ventral and lateral cutaneous branches of the twelfth dorsal and first lumbar nerves. The lower angle of the incision, however, quite uniformly overlaps the anterior branches of the first lumbar (ilio-hypogastric) nerve, as they sweep downward and outward from their point of emergence through the aponeurosis, about five centimetres above the external ring. The upper angle of the incision, depending somewhat on its distance from the median line, and also upon the variable and

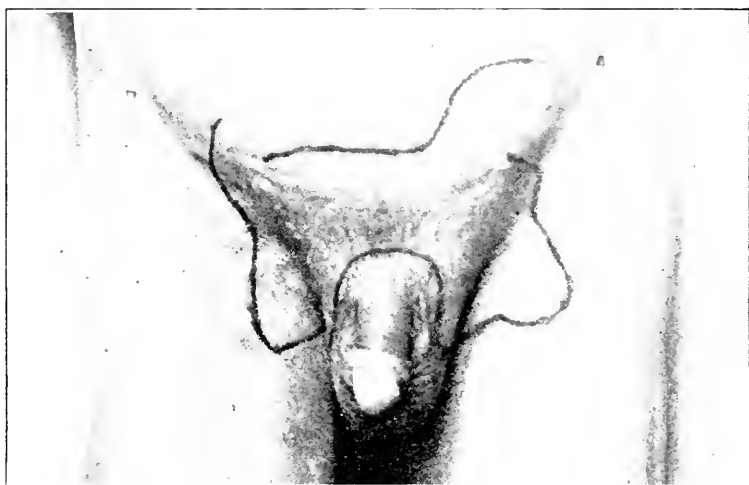


FIG. 8.—Areas of anæsthesia after double cocaine herniotomy. Anæsthesia lies to the inner side of left incision, which was made nearer Poupart's ligament and has divided lateral cutaneous branches of twelfth dorsal. It lies to the outer side of the right incision made farther from Poupart's and dividing fibres from the anterior division of twelfth dorsal.

complementary length of filaments of the ventral and lateral branches of the twelfth thoracic, may divide fibres from one or the other of these sources, and thus lead to a subsequent area of anæsthesia to the inner or outer side of this upper angle of the incision. This is well illustrated by the accompanying photograph (Fig. 8) of a double herniotomy, in which the incisions were made at different distances from the median line. This bordering anæsthesia, on one side or other of the skin

incision, may occasionally represent the entire area of post-operative cutaneous anæsthesia, even when the ilio-inguinal and genital branch of the genito-crural have been divided or cocainized, as is shown in photograph (Fig. 9). Presumably in such instances the crural branch of the genito-crural supplies the area on the inner side of the thigh, usually accredited to the former two nerves. Such an arrangement occurs occasionally in Dr. Bardeen's diagrams.

Deeper Nerves met in the Operation.—The ilio-inguinal



FIG. 9.—Showing small post-operative area of anæsthesia to the inner side of the incision, consequent to the division of lateral cutaneous branches of the twelfth dorsal. In this case the ilio-inguinal and genital branch of the genito-crural had been divided with loss of cremasteric reflex, but without producing any cutaneous anæsthesia.

nerve emerges from the external ring, and near by, or also through the ring, the genital branch of the genito-crural appears. In the canal they usually are found anastomosed as one trunk, the early cocainization of which at the deeper part of the canal, after splitting the aponeurosis beyond the internal ring, is perhaps the most important step of the operation. As has been stated above, this may result in no additional cutaneous anæsthesia. The usual anæsthetic sequel, however, is represented by a complete loss of sensation of the entire scrotal

contents, cord, hernial sac, and testicle, with the possible exception of its lower vascular supply (superficial perineal), and by a cutaneous area of anæsthesia which occupies the inner side of Scarpa's triangle, spreading over the adductor tendons. Division of the nerve is unassociated with any surface anæsthesia of the scrotum whatever (cf. Fig. 10). It is ordinarily stated, to the contrary, that these nerves are a source of cutaneous supply to the scrotum; for instance, Professor Thane says



FIG. 10.—Area of anæsthesia of ilio-hypogastric, ilio-inguinal, and genital branch of genito-crural in a unilateral cocaine case, following operation. This began to fade by the twenty-first day, with return of cremasteric reflex. This represents the most complete type of anæsthesia in unilateral cases, and is the same even after division of the cord and castration, and consequent section of all possible cutaneous filaments of the genital branch of the genito-crural and the ilio-inguinal.

(Quain's "Anatomy," Vol. iii, Pt. II, p. 341, 1895), "The root of the penis, on its dorsal aspect, and a part of the scrotum anteriorly are supplied by the ilio-inguinal and genito-crural nerves." It was of extreme interest, consequently, to find that the ilio-inguinal, supplying most of the *contents* of the scrotum, was not represented by any *cutaneous* supply to the same. The inferior pudendal of the small sciatic and superficial perineal of the internal pudic, therefore, supply in most cases, at all events, its entire cutaneous surface. It is possible that, on the principle

of Sherrington's observation concerning the overlapping of sensory areas, we might account for the failure of anæsthesia after division of the single nerve to appear over its whole territory

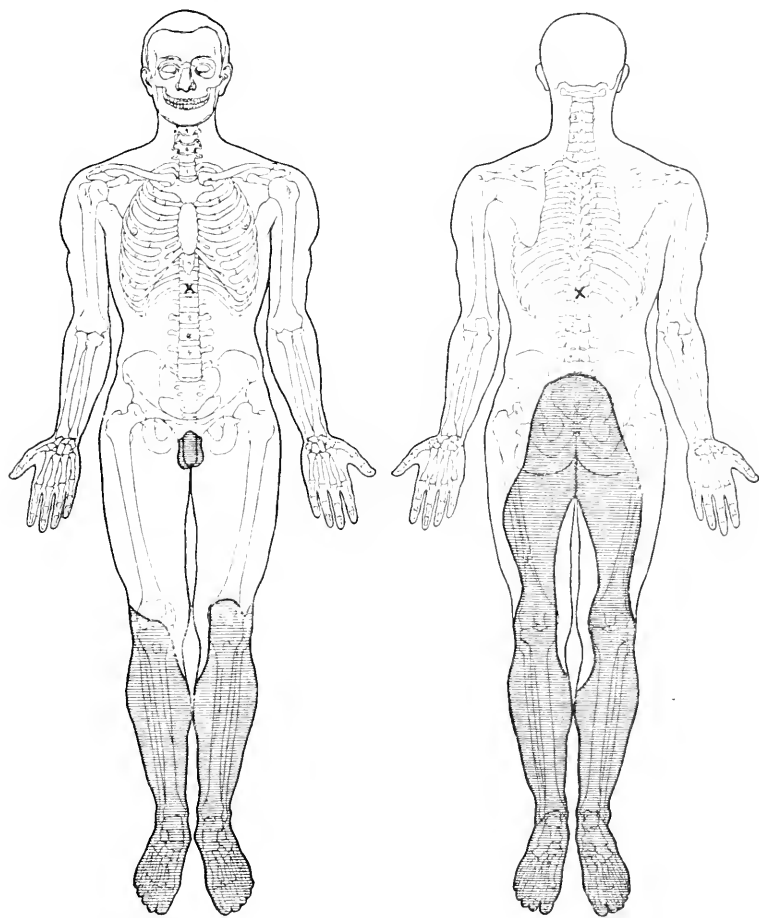


FIG. 11.—Areas of cutaneous anæsthesia resultant to a compression fracture of the twelfth dorsal vertebra, producing a total transverse lesion at the fifth lumbar segment. Scrotal and penile anæsthesia is complete, though the lesion lies below the first lumbar (ilio-inguinal) segmental level.

of supply, but as will be seen by comparing segmental spinal lesions such an explanation will not hold, and probably the whole scrotal cutaneous supply is from the sacral and not the lumbar plexus. A case of fracture-dislocation of the spine at

the twelfth dorsal vertebra, with transverse lesion of the cord, entered the hospital at the time these observations were being made, and offered confirmatory evidence of what has just been stated. The anæsthetic areas resultant to this injury, and which are shown in the accompanying diagrams plotted by Dr. Yates (Fig. 11), offered an interesting negative of the anæsthesia following the hernia cases. Though the entire penis and scrotum in this case were devoid of sensation, the transverse lesion of the cord was situated at the fifth lumbar segment,—that is, between the level of origin of the ilio-inguinal (first lumbar) and that of the small sciatic and internal pudic (second and third sacral) nerves. If the ilio-inguinal normally overlapped the latter nerves, the root of the penis and upper part of the scrotum would naturally have retained sensation. A similar condition is shown in one of Kocher's diagrams of a case of fracture-dislocation at this level.

Furthermore, in this spinal case, as would be expected, the cremasteric reflex was retained, whereas we have observed that after division of the ilio-inguinal and genito-crural nerves, this reflex is, temporarily, at all events, lost on the side of division.¹ On the other hand, the vermicular movements of the dartos, supplied together with the skin by the sacral nerves, are preserved after division of the ilio-inguinal, but were lost in the spinal case together with the cutaneous anæsthesia.

The ilio-hypogastric, as will be seen in the diagram (Fig. 7), may be twice encountered in the operation; its superficial supply by the skin incision, as has been described, and its deeper trunk, as it lies upon the muscle-fibres of the internal oblique at a varying distance from the lower edge of muscle, by the incision which divides this muscle (Fig. 12). Cocainization of the edge of this muscle, consequently, before its division is very necessary, especially since, in addition to this main trunk, which may usually be easily recognized after exposure of the internal oblique, there are, contrary to Griffin's observations, offshoots to the muscle itself from this nerve, given off dorsad to the portion exposed by the incision, as well as fibres from the genito-crural (Thane), which also supply this lower border of

¹ It is important, therefore, to guard against division of these nerves in varicocele operations in which it is desirable to preserve cremasteric tone.

the internal oblique. The area of cutaneous anæsthesia, which follows anæsthetization or division of the main exposed trunk, surrounds the lower angle of the incision, and extends from a level about seven centimetres above the root of the penis to within one or two centimetres of that organ. No anæsthetic area has ever been found corresponding to Macalister's described branches reaching up towards the umbilicus. In unilateral cases this ilio-hypogastric anæsthesia does not extend to the median line, owing to the overlapping of fibres from the opposite side, so that in bilateral cases alone, such as are illustrated by Fig. 8, can its limits be definitely made out.

THE ANÆSTHETIC, AND APPLICATION OF ANATOMICAL OBSERVATIONS TO THE OPERATION.

It is not within the scope of this paper to discuss the relative merits of various local anæsthetics; suffice to say that we have found the combination advocated by Schleich ("Schmerzlose Operationen," 1899) to be as efficacious as any with which we have experimented. His solution No. 2, containing the following ingredients,

Cocainæ mur., . . .	0.1
Morphinæ mur., . . .	0.02
Sodii chlor., . . .	0.2
Aqua destillata, ad	100.00

has best served our purpose, and has been without the objections usually accredited to cocaine solutions,—viz., toxicity and dissolution when sterilized. Solutions in strength of 1 to 20,000 Schleich claims to be efficient for infiltration, and capable of producing anæsthesia which is free from the prodromal hyperæsthesia, the "anæsthesia dolorosa," which accompany water and saline infiltrations. Amounts of the 1 to 1000 solution, however, greatly in excess of what is needed for the longest operation, have failed to give toxic symptoms, and, contrary to the experience of many, we have found that one or two sterilizations fail to diminish its efficiency. Experience with eucaine β , which Braun (*Archiv für klinische Chirurgie*, 1898) and Hentze (*Archiv für pathologische Anatomie und Physiologie*, 1898) have so strongly advocated, has failed to demonstrate any

superiority over the 0.1 per cent. cocaine solution of Schleich. In fact, we have been impressed by the fleeting nature of the anæsthesia and by its tardy appearance.

On several occasions long skin incisions have been made through a linear area of anæsthesia, produced half with sterilized Schleich's solution and half with the eucaine β combination, which Braun advocates. If the operation is prolonged over an hour, pain is occasioned on placing the subcuticular suture of closure in the eucaine area, while none appears in that which had been infiltrated with cocaine. The fact that its toxicity is five times greater than eucaine does not argue in its disfavor, provided one uses solution weak enough to avoid toxic effects. For anæsthetization of the individual nerve-trunks I have used a $\frac{1}{2}$ to 1 per cent. sterilized solution of eucaine β or cocaine which is injected directly into the nerve.

Steps of the Operation.—Individuals advanced in years are usually kept in bed for a day or two preliminary to the operation, to give an indication of their ability to endure recumbency and for the purpose of training them to void their urine in this position. Evacuation of the bladder is usually accomplished by the aid of an enema if any postural difficulty is experienced; and it is a matter of satisfaction that but one of the cases reported required post-operative catheterization (Case XVI), an old man, sixty-eight years of age, who had symptoms of prostatic hypertrophy.

It has been the custom to administer hypodermically a tenth or an eighth of a grain of morphine, three-quarters of an hour before, and to repeat this shortly before the operation. Ceci has emphasized the efficiency of this morphia-cocaine combination, and I have found it most satisfactory. The drug must be used with caution, however, since occasionally even small doses of morphine in old people may confine the bowels and lead to distention, which may be troublesome, as Case XV of our series illustrates. Similarly, in old people with tardy bladders, it may inhibit the proper evacuation of the urine, though we have never had the misfortune to observe this.

Patients past middle age also are usually shaved and prepared on the operating-table, to avoid any exposure incidental to an open ward preparation. The skin in the line of proposed

incision is infiltrated with Schleich's cocaine solution, and the incision may be immediately made through the linear wheal thus produced. It is common experience to find the infiltrated tissues more vascular than usual, and it is important that all bleeding points be immediately clamped, since a dry and unstained field is essential to the success of the dissection. It is unnecessary and useless to attempt to anæsthetize the panniculus. As Schleich has shown, only tissues which can be "œdematized" are fitted for the infiltration method, and in the panniculus, at the upper angle, practically no nerves are encountered. If, however, throughout its whole length, this incision is carried down to the aponeurosis, unanæsthetized fibres of the ilio-hypogastric will be encountered in the superficial fat at the lower angle, together with one or two large veins, division of which is painful, so that anæsthetization of the panniculus layer is here necessary, or else, as has been done on several occasions, the incision only at the upper angle may be carried down to the aponeurosis, which is then opened in line of fibres from the external ring and the ilio-hypogastric and inguinal nerves immediately cocainized with a 1 per cent. solution as they lie under it. After this procedure the lower angle of the incision may be painlessly carried down to the external ring, and the remaining intercolumnar fibres of the aponeurotic insertion divided. Reflection of the pillars of the ring gives the view shown in the accompanying sketch (Fig. 12). In the Halsted operation at this stage the internal oblique fibres are divided, preliminary cocainization of the edge of muscle being necessary for the reasons given above. There is, under ordinary circumstances, no further need of the anæsthetic, as we are working in an area freed from all sensation. The combined ilio-inguinal and genital branch, which has been cocainized at the outer limit of its exposure, is now reflected to one side or the other, care being taken not to divide it, since this leads apparently to a more or less permanent paralysis of the cremaster, which is to be avoided. I believe the accidental division of this nerve leads to the great relaxation of the scrotum so often seen after hernia and varicocele operations. In the latter operation, especially, it would be detrimental to the best interests of a successful result to interfere with the cremasteric

function in any way. The remainder of the operation, the exposure of the sac and cord after a longitudinal division of the infundibuliform fascia, the amputation of the sac at its neck, and closure of the peritoneal opening, the excision of the fundus of the sac, division of the cord and castration, if

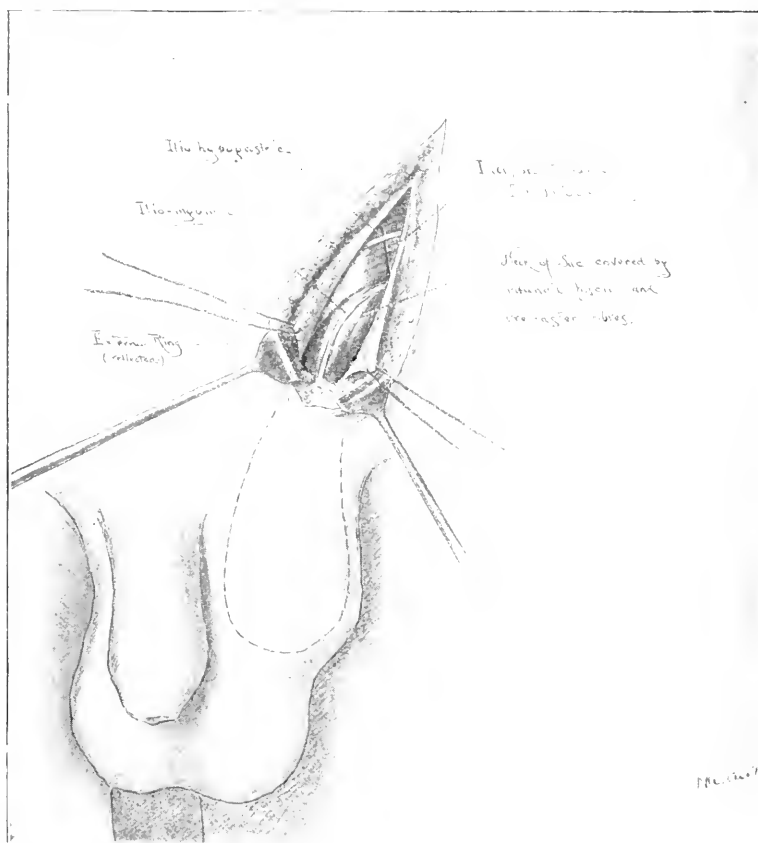


FIG. 12.—Sketch showing usual situation of nerves as exposed after reflection of the divided aponeurosis.

deemed advisable, may now be done practically without pain. Occasionally, however, some stray fibres of the genito-crural may be encountered about the neck of the sac, and also during castration I have found that ligation of the veins at the lower pole of the testicle may be painful, though division of the cord

above is not. Possibly the superficial perineal branches which have been unanæsthetized furnish nerves to this lower blood-supply.

The closure of the parietes by any of the more commonly employed methods may now be painlessly accomplished. Not infrequently in these cases, in old people with large hernias of long standing, the two rings have become concentric, and the falciform expansion of the conjoined tendon is no longer present. It is in such cases that Bloodgood has advocated transplantation of the rectus fibres after opening of the sheath and exposure of this muscle, so that a muscle-lined wound may be formed throughout the whole length of the inguinal region. No additional cocainization is necessary for this step. Tightening the deep sutures in closing the wound causes some discomfort, which the patient usually describes as an uncomfortable sensation of "pressure." The subcuticular silver suture, used in closing the skin, does not pass beyond the limits of the original area of cutaneous infiltration, and consequently it may be placed without pain. It occasionally happens during the operation, whether from slight ability on the patient's part to endure discomfort or from the accidental division of some sensory fibres, that what inhibition towards pain he may have at first possessed becomes exhausted, and recourse must be had to a general anæsthetic. Under these circumstances we have found that a few inhalations of chloroform—not enough, however, to make the patient lose consciousness—are sufficient to tide him over the most difficult parts of the operation. It is remarkable, under such circumstances, how small an amount of the general anæsthetic is required to benumb sensation. We may justly speak, therefore, of the method of anæsthesia which is employed as a morphia-cocaine-chloroform combination, the first and last drugs being merely adjuvants of the local anæsthetic, which in most cases suffices alone.

An assistant in these cases who takes the place of the anæsthetist occupies by no means an unimportant position. The usual record of pulse and respiration is kept, and by occupying his attention and by timely encouragement the patient may be tided over the more trying periods of his operative

ordeal; duties which otherwise devolving upon the operator may be distracting. Lilienthal (ANNALS OF SURGERY, 1898, p. 58) speaks of this position as that of a "moral anæsthetist."

Patients have never complained of post-cocainization pain in the region of the incision, and healing seems to have been absolutely unaffected by the local infiltration. In none of these cases has there been other than primary union. It is very unusual for the large, starched, or plaster dressings, immobilizing thigh and pelvis, to be cut down before the tenth or twelfth day, when the suture is removed.

Advantages of the Local Anæsthetic.—There is an avoidance of unpleasant or dangerous post-etherization sequelæ. There is no vomiting or retching to put strain upon the recent sutures. Urinary disturbances are much less apt to occur, and catheterization is rarely necessary. The diet continues as before the operation. There is no backache, since there is no narcosis to induce relaxation of spinal muscles. The dressings may be applied originally to suit the comfort of the patient, which is of especial importance in old people, and there is no subsequent disarrangement of them. Above all is the advantage gained in being able to operate with comparative safety in patients who would incur immediate risk in submitting to general anæsthesia.

Disadvantages.—These seem trivial in comparison. More time is consumed in the operation, and there is necessarily some distraction to the surgeon. The operation is doubtless more difficult and some pain is inflicted. The degree of this depends entirely, however, upon the surgeon's familiarity with the steps of the operation and his knowledge of the anatomical distribution of the sensory nerves of the region concerned. On many occasions no actual pain whatever need be experienced, and should there be some, it is small in comparison with the discomforts of an ether convalescence, and the greater difficulties which confront the surgeon at the operating-table are more than compensated for by his subsequent freedom from the anxiety which, in this particular class of cases, attends the administration of, and convalescence from, general anæsthesia.

INTERSCAPULO-THORACIC AMPUTATION.¹

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BERGER, in 1891, advocated interscapulo-thoracic amputation in all cases of malignant disease of the upper extremity of the humerus in preference to the disarticulation of the humerus. This was advocated in a discussion before the Surgical Society of Paris. Monod, of Bordeaux, presented a paper at that meeting upon "Interscapulo-Thoracic Amputation." There was some divergence of opinion as to the necessity of sacrificing the extremity in this class of cases. Some were in favor of resection.

Lejars, in 1896, reported to the Surgical Congress, convened at Paris, a case of resection of the upper extremity of the humerus for periosteal sarcoma, in which the cure was permanent. This again attracted Berger's attention to the matter, and he began a systematic search for other cases of this kind. This search resulted in establishing to his own satisfaction that in cases of malignant disease of the upper extremity of the humerus interscapulo-thoracic amputation was the operation of choice. In his researches particular attention was paid to those cases in which disarticulation had been done, and in which recurrence had necessitated subsequent removal of the scapula. This further strengthened his opinion regarding the complete amputation. He advocated a method of operating which he claimed to be methodical, rapid, and free from danger, and which in two

¹ Read in abstract before the Brooklyn Surgical Society, June 2, 1899.

cases of his own had proved of permanent benefit. His first case, a country postman, was free from recurrence and pursuing his occupation sixteen years after the operation. The tumor in this case was an enchondroma. The second case, a myxoma, was free from recurrence eighteen months after the operation. In 1887, Berger published his first table of cases of interscapulo-thoracic amputation. This included fifty-one cases, only six of which were necessitated by malignant disease of the humerus, including his first case. Since then Adelman, Schultz, Nasse, and others have collected series of cases. In 1898, Berger again tabulated a number of cases. Many of these are of use only in calculating the mortality of the operation. The table makes the mortality of the operation entirely too low, and in fact gives too rosy a view of the operation.

The *indications* for interscapulo-thoracic amputation are fairly well defined. The operation has been done in cases of extensive injury to the arm and shoulder region, involving so considerable a loss as to render the life of the member improbable. Such injuries have been produced by machinery accidents in which the arm and part of the scapula have been torn away, partially or completely; by compound comminuted fractures of the shoulder region; by gunshot and explosion accidents; by extensive lacerations from the bites of animals; by extensive burns. The operation has been done for caries, extensive local tuberculosis, for gangrene and sepsis, for osteomyelitis. It is indicated in injuries of the brachial plexus in the neck (such as are produced by stab-wounds) resulting in paralysis, severe neuritis, and trophic disturbances, which do not yield or are not benefited by operation (suturing of the cords of the plexus in the neck); also in cases of pain of the entire upper extremity, due to severe neuritis, which does not yield to other treatment or to section of the brachial plexus in the neck, or to section of the posterior nerve-roots. In cases of carcinoma of the breast, whether recurrent or primary, involving the axillary vein and brachial plexus, and thus producing œdema and pain. In benign tumors which, by reason of their location and great size, render the extremity painful and useless, and in which malignant changes might be expected to

take place. The operation is indicated in malignant tumors, particularly sarcoma, at or in the neighborhood of the shoulder-joint. I wish to add that *this operation should be done in all cases of malignant disease of the humerus, however located, whether in the upper extremity, shaft, or lower extremity of the bone.*

Operation: First Step.—The patient is placed flat on the back with a small sand-bag between the scapulæ, the affected side overhanging the edge of the table. This throws the clavicle well forward. During anæsthetization the arm is elevated and abducted in order that as little blood as possible may be removed with it. No tourniquet or bandaging of the arm is to be employed for the purpose of rendering it bloodless, as the pressure might result in the forcing of tumor products, tubercular infection, or sepsis, directly or indirectly into the general circulation. A straight incision is made over the clavicle extending from the insertion of the sterno-mastoid to the acromion. This incision is deepened to the periosteum, which is divided and pushed back. A chain-saw is passed around the inner third of the clavicle and the bone sawn through. The outer portion is now elevated and separated from the underlying subclavius muscle and periosteum, and a section three inches in length removed. This brings into view the subclavius muscle, which is cut through close to its attachment to the clavicle. By thoroughly sectioning and turning outward the subclavius muscle abundance of room is obtained in which to secure the vessels. The several layers of fascia which overlie the vessels at this point are divided. The upper border of the pectoralis minor should now be seen in the field of operation. The external anterior thoracic nerve is one of the guides to the vessels. It can be both seen and felt leading upward to the interval between the artery and vein. If it does not come into the field of operation, as was the case in one of Keen's cases and in my own, it can readily be found. Careful digital exploration for the arterial beat will always be a sure guide, except in cases of profound shock, when the external anterior thoracic nerve will be found useful. There may be some bleeding during this first step from the acromio-thoracic and from the cephalic

vein. The subclavian artery and vein, being identified, are well isolated, and a double ligature of braided fine catgut or of coarse single strands of catgut are tied, one inch apart, on the artery and vein separately, and the vessels divided between them. All ligatures should be placed before being tightened, those on the artery being tied first. Treves recommends the latter in order that as little blood as possible be left in the extremity. Other operators, among them Keen and Wyeth, have also called attention to this. The isolation of the vessels is to be carefully done. Any injury to the vein may result in the entrance of air and possibly consequent death. The suprascapular vessels should be secured. They will generally be seen crossing the upper portion of the wound. Every vessel during this stage should be clamped as soon as cut, so that no blood will obscure the field of operation.

Second Step.—The second stage consists in marking out and reflecting the flaps. As much of the skin and soft parts is to be removed as compatible with the accurate apposition of the flaps without puckering. The patient is partially turned upon the unaffected side. The arm is placed under the control of an assistant, who attends solely to carrying out the operator's directions as to its position. The extremity is partially abducted, and a skin incision, beginning at about the inner third of the clavicular incision, is carried downward and outward over the portion of the pectoralis major which forms the anterior boundary of the axilla, and thence downward and outward to the anterior border of the latissimus dorsi. During the latter part of this incision the extremity is further abducted, so that when the latissimus dorsi is reached the extremity is at a right angle with the body. The arm is now brought forward across the chest and the posterior flap marked out. The posterior incision commences from the same point on the clavicular incision as did the anterior, and, crossing the spine of the scapula in a downward and outward direction, ends at the terminal point of the anterior incision. The extremity is drawn away from the body, thus throwing into prominence the pectoralis major. This is divided, and the tendon of the minor cut. The brachial plexus is sectioned at the same level as the ligated vessels. The patient

is further turned on the unaffected side, and the arm again thrown across the chest, the posterior flap reflected to the vertebral border of the scapula, and the muscles attached there severed. At this point the posterior scapular vessels must be secured, and also the suprascapular, if these have not been ligated during the first step. If no anomalies are present, very few ligatures will be required. The preliminary ligation of the subclavian absolutely shuts off all blood-supply to the parts, with the exception of the suprascapular and posterior scapular. The flaps as outlined above differ slightly from those advocated by Faraboeuf. The flaps must depend to a great extent upon the condition for which the amputation is done. Keen's flaps were modified to suit the exigencies of his case.

Advantages of the Described Operation.—(1) Hæmorrhage is absolutely prevented. (2) The danger of wounding or tearing the vein, and thus admitting air into the circulation, is minimized. (3) The only point where arterial bleeding can occur is while sectioning the scapular muscles. This is left till last.

Complications.—Difficulty in finding the artery. This might happen in case of large tumors displacing the artery. Such a case has been reported (Macnamara).

Difficulty in finding the vein. This might occur in traumatic cases in which extreme injury to the vessels in the neighborhood of the shoulder-joint would result in collapse of the vein. Parise reported such a case.

Even in comparatively uncomplicated cases, the ligation of vessels is a matter which requires patience. It takes more time than all the rest of the operation. Having secured the vessels, the operation is simplicity itself and quickly performed. The whole success of the procedure depends upon the accurate localization of the artery and vein, and their ligation without unnecessary traumatism.

Dangers of the Operation: Hæmorrhage.—This may arise from severing of the main trunk, the axillary branches, or the enlarged veins in the neighborhood of a tumor. Preliminary ligation fairly meets the first two of these conditions, and goes far towards preventing the third. It obviates the danger of air entering the large veins and prevents all bleeding from the large

wound, except during the division of the scapular muscles, the blood-supply of which is not cut off. If, on account of the size and position of the growth, it is found impossible to ligate the subclavian after division of the clavicle, the pectoralis major and minor may be divided and the axillary artery tied as high up as is possible; or tracing it up to the scalenus anticus, there ligate the subclavian artery.

The danger of hæmorrhage cannot be overestimated. The immediate success of the operation depends to a great extent upon the amount of blood lost. The control of hæmorrhage is, as Keen has aptly said, "the key to the entire situation." There are several methods of controlling hæmorrhage, the best of which has been incorporated in the description of the operation given above, the method commonly associated with the name of Berger. Other methods have been used, chief among them being simple compression of the subclavian artery, compression of the subclavian artery after resection of the clavicle, preliminary ligation of the artery without resection, ligation of the artery after resection of the middle third of the clavicle, leaving the vein and brachial plexus until the rest of the operation has been completed, then section of the plexus and ligation of the vein. This last is done in order that as little blood as possible may be removed with the extremity. It was used by Wyeth in one of his cases, but is open to the objection of the danger of tearing the vein during the necessary manipulations of the arm, and thus affording an opportunity for the entrance of air. Disarticulation of the sternal end of the clavicle and ligation of the vessels under the inner third have been done. Secondary hæmorrhage may occur. Chavasse reports an interesting case in which this occurred on the seventeenth day. It was necessary to make a further resection of the clavicle and secure the subclavian artery in front of the scaleni.

Shock.—The main preventive measure is preliminary hæmostasis. The extremity should be emptied of as much blood as possible by elevation, but, as pointed out above, the Esmarch bandage should not be used in cases where tumor products or sepsis might be forced into the circulation. In other respects, shock should be met as in other cases, by the liberal use of

strychnine, whiskey, heat, enemata of hot saline solution, and intravenous infusion.

Septicæmia.—This is mentioned by Jacobson as a possible danger if badly coapted flaps are left. Retention should never occur, nor should there be any trouble in making well-fitting and closely approximated flaps. The facilities for drainage are perfect, far better than in disarticulation at the shoulder-joint, and if septicæmia occur, due to puckering of the flaps or retention of discharge, it is an unpardonable accident. More or less prolonged suppuration was a complication of some of the cases reported, but in only one case was sepsis of grave import. In Berger's first case a retained rubber drainage-tube caused a fistulous tract to persist until the discovery of the tube and its removal.

*Entrance of Air into the Veins.*¹—This has been noted in a number of cases of interscapulo-thoracic amputation, and in some instances has nearly proved fatal. Mussey's case (1837) was such an one. The symptoms are immediate and alarming. The pulse becomes weak and rapid, respirations become slower and slower. Death occurs with symptoms of cerebral anæmia. The treatment is persistent artificial respiration, the injection of cardiac stimulants directly into the circulation, and in some cases the application of a closed piston-syringe to the proximal end of the injured vein, and the mechanical withdrawal of the aspired air mixed with blood from the heart.

In twenty cases collected by Gross in 1867, in which the internal jugular was wounded, five died from entrance of air into the vein.

Lane, of San Francisco, had an opportunity of studying the effect of the entrance of air into a vein through which a transfusion was being done. After a quantity of fluid had entered the circulation, by some mischance air entered, with the result that the patient gave a convulsive gasp and died (L. C. Lane, "Surgery of the Head and Neck," p. 1136).

Reddy in 1667 mentioned the entrance of air into a vein. In 1842 there were reported several deaths from this cause. In

¹ L. C. Lane, Surgery of the Head and Neck, San Francisco.

a case of simple bleeding from the basilic vein, death is reported to have occurred through the entrance of air (Simon).

Several writers have offered explanations of the cause of death. Marchal believed that the mixture of air and blood formed carbonic acid which poisoned the system. Mercier taught that air and blood formed an elastic mixture which the heart was unable to propel, and which regurgitated into the veins; that even if this mixture reached the lungs it was impossible for it to pass them. Wattman in 1842 observed that this accident occurs when the veins are tense, when they are thickened, and when they are only partially divided. When a hissing sound is heard, it indicates that the air is entering a vein; when the sound is a gurgling one, that air and blood are mixing. The symptoms noted by this observer were that the patient made an outcry, became pale, covered with perspiration, lost consciousness, and died in a convulsion. In 1843, Erichsen wrote that the blood and air combined to form foam, which could not pass through the vessels in the lungs. Elliot claimed that it was impossible for the air to pass the heart; that it was alternately driven from the right ventricle to the auricle and back; that air expanded the heart and thus lessened its power; that if the air reached the lungs it was there cooled and forced to return to the heart. In cases in which there is a probability of the entrance of air, Erichsen advocated bandaging of the thorax as a precautionary measure, as the air was sucked into the veins during deep inspiration. Gay, while removing a tumor from the axilla, had air enter a vein. This case is also reported by Lane. There was syncope, and the patient did not rally for an hour.

The autopsies performed upon cases which have succumbed to this accident show a contracted left ventricle; the right side of the heart, more especially the ventricle, being full of blood mixed with air; also blood and air in the pulmonary artery; lungs congested and containing mixed blood and air. Death is due to asphyxia, not to the irritation of air in the cerebral vessels, as taught by Bichet, nor from paralysis of the heart, nor from the presence of carbonic acid, as taught by others.

In 1876, Couty, of Paris, wrote upon this subject. He

claimed that death was not due to embolic obstruction in the lungs, but caused by a systole of the right heart, resulting from the presence of air there, and, as a final result, death is due to suspension of the pulmonic circulation. Couty divided the phenomena into four stages: (1) Diminished aortic pressure and increased cardiac action. (2) Aortic pressure still further diminished and further increase in heart's action. In this stage there is pallor, syncope, rapid breathing, and dilated pupils. (3) Blood-pressure vanishes, breathing is slow, urine and feces escape involuntarily. (4) Cessation of breathing and later cessation of heart action. In 1876, Picard experimented on animals by injecting air into the portal vein. This produced hyperæmia of the rootlets of the portal system, increased the rapidity of the heart, slowed respiration, and lowered temperature. In 1877, Fisher reported two cases in Volkmann's *Klinische Vorträge*, both of which recovered. In Fisher's case recovery took place by coughing, blood being thereby forced from the wounded vein, carrying with it the contained air. In 1859-1860, Dr. E. S. Cooper, of San Francisco, before his class of students, forced air (by means of a piston-syringe) into the femoral vein of a dog. The dog immediately stopped breathing and seemed to be dead. The piston of the syringe was then drawn back, causing blood and with it the injected air to flow into the barrel of the syringe, with the effect of restoring the dog to life. This treatment might be applied to patients the victims of this accident (Lane). Uterhart, of Berlin, in 1870, injected air into the veins of dogs. He found that when air was injected at a considerable distance from the heart, as the femoral vein, no injury resulted, but if injected into the external jugular, there followed speedy death with symptoms of cerebral anæmia. Air thrown into the arteries was followed by no ill effects, whether injected near to or at a distance from the heart.

ABSTRACT OF RECORDED CASES.

(I) Primary interscapulo-thoracic amputation for malignant disease (without previous resection or disarticulation), seventy-two cases.

I have been able to collect seventy-two cases in which

primary interscapulo-thoracic amputation was done for malignant disease of the humerus. Some from Berger's table are included and some are rejected, according as they fulfilled the requirements or not. To be placed in this table the interscapulo-thoracic amputation must have been primary,—that is, done without previous resection or disarticulation. Some cases have, indeed, been placed in this table which had previously had other operations, but in which the previous procedures could have had no effect in increasing the danger of the final operation or influencing the final result.

CASE I (1838).—Twitchell, of Keene, N. H. Malignant tumor. Interscapulo-thoracic amputation: recovery. Death from recurrence in a few months. This case was never reported by the operator, who kept no notes of the case. His nephew, Dr. G. B. Twitchell, furnished these notes to Stephen Rogers. Reference, *New York Medical Journal*, 1869, viii, p. 434.

CASE II (1838).—G. MacClellan. Male, aged seventeen. Encephaloma. Interscapulo-thoracic amputation, most of the clavicle being removed: recovery. Death from recurrence in six months. Claimed by author to be the first case on record of primary interscapulo-thoracic amputation. Reference, MacClellan's "Surgery," 1848, p. 412.

CASE III (1845).—R. D. Mussey, Cincinnati. Male, aged fifty-six. Osteocancer. Interscapulo-thoracic amputation, one-half of the clavicle being removed: recovery. No recurrence nine years after the operation. Reference, *American Journal*, 1837-38, p. 386.

CASE IV (1862).—J. C. Whishaw, Fyzabad, E. I. Male, aged eight. Encephaloma of the scapular region, shoulder-joint, and clavicle. Interscapulo-thoracic amputation: recovery. No recurrence several months later. Reference, *Lancet*, London, 1874, i, p. 819.

CASE V (1867, June 30).—Kenneth McLeod. Male, aged two. Enormous encephaloid tumor of the right arm, extending from the elbow to the infrapinnous fossa; congenital; seventeen inches in circumference, tense, and fluctuating. Exploratory puncture showed blood. Patient was in a very weak state. Interscapulo-thoracic amputation, a skewer being used to control hæmorrhage. Death from shock soon after the operation. Reference, Reprinted from the *Indian Medical Gazette*, September, 1867; *Edinburgh Medical Journal*, 1869, Vol. xv, Part i, p. 567.

CASE VI (1867, September 2). Thiersch, Leipzig. Male, aged thirty-four. Enchondroma molle of the right shoulder region; had been present for one year. Interscapulo-thoracic amputation. During the operation air twice entered the axillary vein. Death in five days, with symptoms of œdema of the lungs. Autopsy revealed a sero-purulent collection in the left pleural cavity. The pulmonary artery and vein were surrounded by a mass of enchondroma. Reference, Wagner's *Archiv für Heilkunde*, Jahrgang x, 1869, S. 460 (Birch-Hirschfeld).

CASE VII (1867, October).—William Fergusson, London. Male, aged forty. Osteosarcoma of the shoulder. Tumor followed a fall on the shoulder two years before. Interscapulo-thoracic amputation. Chloroform. Six ounces of blood lost. Shock. Death occurred four days later. Autopsy showed fatty condition of the heart, liver, and kidneys. Reference, *Medical Times and Gazette*, 1867, Vol. ii, p. 465; *Lancet*, London, 1867, Vol. ii, p. 465; *Lancet*, London, 1867, Vol. ii, pp. 525 and 552.

CASE VIII (1873).—Parise, Lille. Male, aged twenty. Osteosarcoma. Interscapulo-thoracic amputation, with preliminary ligature of the subclavian artery and vein: recovery. Death from recurrence in the lung in eighteen months. Reference, De Langenhagen, "Contribution à l'Étude clinique des Tumeurs du Scapulum," Paris, 1883, p. 102.

CASE IX (1873, December 19).—B. von Langenbeck, Berlin. Male, aged seventeen. Vascular sarcoma of the whole shoulder region. Tumor had been present for fifteen months. Interscapulo-thoracic amputation. Death on the fifth day from hæmorrhage due to the slipping of the ligature on the subclavian artery. Reference, Joh. Veit, "Exstirpation von Schulterblatt und Arm," Inaugural Dissertation, Berlin, 1874.

CASE X (1878).—C. Macnamara. Female, aged twenty-four. Chondrosarcoma of the right shoulder, scapula, axilla, and pectoral muscles, of nearly four years' duration, and of the size of an infant's head. The right arm and hand were œdematous, and the brachial pulse feeble. Interscapulo-thoracic amputation. The size and position of the tumor made it impossible to find and ligate the subclavian artery, consequently the hæmorrhage was profuse. Death on the following day from shock. Reference, *Lancet*, London, 1878, Vol. i, p. 669.

CASE XI (1879, October 3).—Edward Lund. Male, aged twenty. Spindle-celled sarcoma of the shoulder-joint, of about four months'

duration. Exploratory incision through the deltoid for purposes of diagnosis. Interscapulo-thoracic amputation: recovery. No subsequent data. Reference, *British Medical Journal*, 1880, Vol. ii, p. 617.

CASE XII (1880, May).—A. P. McGill. Female, aged fifty-eight. Rapidly growing tumor of the left scapula and axilla. Interscapulo-thoracic amputation. Death from infection on the sixth day. Reference, *British Medical Journal*, 1880, Vol. ii, p. 702.

CASE XIII (1880?).—Joseph Bell. Male, aged ten. Sarcoma of several months' duration, involving the supra- and infrascapular regions and axilla. Interscapulo-thoracic amputation, curved skewer being used to control the hæmorrhage: recovery. No further data. Reference, *Edinburgh Medical Journal*, 1885-86, Vol. i, p. 168.

CASE XIV (1882, October 28).—Paul Berger, Paris. Male, aged twenty-seven. Enchondroma. Interscapulo-thoracic amputation: recovery. No recurrence after fifteen years. Reference, *Revue de Chirurgie*, 1898, No. 10.

CASE XV (1883, December 20; 1884, July 15).—Czerny, Heidelberg. Male, aged forty-one. Spindle-celled sarcoma. Extirpation of the tumor was first done, later interscapulo-thoracic amputation: recovery. Death in December, 1884, from tuberculosis of the lungs and larynx. No autopsy. Reference, *Archiv für klinische Chirurgie*, Band xxxvii, 1888. S. 135.

CASE XVI (1883, July).—Kenneth McLeod. Male, aged twenty. Sarcoma of the arm, shoulder, and axilla. Interscapulo-thoracic amputation: recovery. No subsequent history. Reference, *Lancet*, London, 1890, Vol. i, p. 847.

CASE XVII (1883, July 4).—Christopher Heath, London. Male, aged sixteen. Ossifying sarcoma, having started two years before as a slight thickening of the upper extremity of the humerus, increasing rapidly in the last six months. Involved the scapula and completely fixed the shoulder-joint. Interscapulo-thoracic amputation, the scapula being removed in two parts: recovery. No recurrence seven and one-half months after the operation, except a small nodule in the neighborhood of the scar, which Mr. Heath subsequently removed. No recurrence until Christmas, 1885, two and one-half years after the first operation. May 8, 1886, a small, freely movable nodule was removed from the pectoral muscle and scar. The case was well on July 8 of the same year. Reference, *British Medical Journal*, 1884, Vol. i, p. 412, also 1886, Vol. ii, p. 68.

CASE XVIII (1883, November 2).—Verneuil, Paris. Male, aged

twenty-three. Osteosarcoma of the shoulder involving the scapula and axilla. Interscapulo-thoracic amputation, the scapula being removed in two portions: recovery. Recurrence in six months, and finally death from involvement of the vertebral column. Paraplegia. Reference, *L'Union Médicale*, 1884, p. 1; L. M. Sambucy, "De l'Ablation totale du Membre supérieur avec l'Omoplate," Thèse, Paris, 1883, p. 37.

CASE XIX (1886, January 22).—E. A. Maling. Male, aged fifty. Sarcoma of the scapula, triceps, and humerus, first noted ten months before. After an aspiration had been done tumor grew rapidly and patient began to lose weight. Interscapulo-thoracic amputation: recovery. Recurrence took place in the right parietal region one month later. Reference, *British Medical Journal*, 1886, Vol. i, p. 500, also Vol. ii, p. 1161.

CASE XX (1886, October 13).—Alfonso Poggi, Bologna. Male, aged twenty-seven. Fibrosarcoma of one year's duration. Interscapulo-thoracic amputation. Preliminary ligature of the subclavian was rendered impossible by the size of the growth: recovery. No recurrence three months after operation. Reference, *Bullerrino delle scienze mediche di Bologna*, Ser. vi, Vol. xxi, 1888.

CASE XXI (1887, June).—Bennet May. Female, aged twenty-one. Mixed-celled periosteal sarcoma of the upper end of the humerus, englobing the articulation, the movements of which were fairly free. The disease was of two years' duration. There was a movable secondary tumor in the axilla and a movable nodule in the supraclavicular fossa. Interscapulo-thoracic amputation: recovery. Rapid recurrence in the cervical glands and death within the year. Reference, *ANNALS OF SURGERY*, 1888, Vol. viii, p. 435.

CASE XXII (1887, February 5-17).—Carl Reyer, St. Petersburg. Male, aged fifty-three. Sarcoma first noted March, 1886. In July, 1886, a spindle-celled sarcoma, the size of a goose-egg, was removed. Recurred in October. At time of operation tumor involved shoulder region. Interscapulo-thoracic amputation. Transplantation of human and frog's skin. Recovery. Death from recurrence in the lung in eleven months. Reference, Communicated by the operator to Adelman.

CASE XXIII (1887).—Van Iterson. Male, aged forty-nine. Central osteosarcoma of the head of the humerus with involvement of the scapular muscles. Interscapulo-thoracic amputation: recovery. Still free from recurrence eight months after operation. Reference, *Bulletin de la Société de Chirurgie*, 1887, Vol. xiv, p. 481.

CASE XXIV (1888).—Sondermayer. Female, aged forty-four. Spindle-celled sarcoma of the humerus. Interscapulo-thoracic amputation: recovery. No recurrence in nine months. Reference, *Wiener medizinische Wochenschrift*, 1888, No. 29, 1120 (1889, 39, 1121).

CASE XXV (1888, May).—Bennet May. Male, aged seventeen. Sarcoma of upper end of right humerus of six months' duration, obscuring the shoulder, filling the axilla, overlapping the scapula. Joint movements fairly free. Interscapulo-thoracic amputation: recovery. No recurrence between seven and eight months after operation. Reference, *ANNALS OF SURGERY*, 1888, Vol. viii, p. 437.

CASE XXVI (1888).—V. Bergmann. Male, aged ten. Osteo-sarcoma of the upper one-third of humerus. Interscapulo-thoracic amputation: recovery. Recurrence and death in ten months. Reference, Nasse.

CASE XXVII (1888).—Charles T. Parkes. Male, a youth. Sarcoma of the upper extremity of the humerus involving the shoulder-joint. Interscapulo-thoracic amputation: recovery. No recurrence when last seen, six months after the operation. Reference, *Journal of the American Medical Association*, 1889, Vol. ii, p. 295.

CASE XXVIII (1888, January 24).—V. Bergmann, Berlin. Female, aged thirty-four. Sarcoma of the left humerus. There had been pain and discomfort in the shoulder for two years. Spontaneous fracture of the humerus ten months before. Interscapulo-thoracic amputation: recovery. No data concerning recurrence. Reference, Bramsfeld, "Dissertation," p. 28.

CASE XXIX (1889, January).—Thomas T. Chavasse. Male, aged forty. Chondroma of ten years' duration of upper portion of right humerus. The clinical diagnosis of chondrosarcoma was made. Interscapulo-thoracic amputation. Secondary hæmorrhage occurred on the seventeenth day requiring ligation of the second part of the subclavian. Tumor weighed eighteen pounds. Recovery. No recurrence one year after operation. Reference, *British Medical Journal*, 1890, Vol. i, p. 131; also *Lancet*, London, 1890, Vol. i, p. 131.

CASE XXX (1889).—Charles T. Parkes. Male, aged thirty-seven. Sarcoma of the shoulder region. Interscapulo-thoracic amputation. Three weeks before operation the tumor had been removed as far as external manifestations. Patient reacted nicely at first, but death occurred fifty-six hours later. Reference, *Journal of the American Medical Association*, 1889, Vol. ii, p. 295.

CASE XXXI (1889).—Southam. Female, aged eleven. Round-celled sarcoma of the scapula, shoulder, and axilla. Interscapulo-thoracic amputation: recovery. No recurrence up to six weeks. Prognosis bad. Reference, *British Medical Journal*, 1889, Vol. ii, p. 1334.

CASE XXXII (1889).—Küster. Female, aged twenty-nine. Sarcoma of humerus. Several spontaneous fractures. Interscapulo-thoracic amputation: recovery. No further data. Reference, Berger.

CASE XXXIII (1889, April).—Edwin A. Lewis. Male, aged forty-seven. Osteosarcoma of humerus following an injury two years before. Involved shoulder-joint. Interscapulo-thoracic amputation: recovery. No recurrence eight months after operation. Reference, *ANNALS OF SURGERY*, 1890, Vol. ii, p. 88.

CASE XXXIV (1889).—Von Bergmann. Encapsulated periosteal sarcoma of humerus. Interscapulo-thoracic amputation: recovery. No recurrence three and a half years after operation. Reference, Nasse, Berger.

CASE XXXV (1890, October 14).—John A. Wyeth. Male, aged fifty-four. Sarcoma. Interscapulo-thoracic amputation. Nine months before a tumor had been removed from the long head of the triceps. This recurred in less than six months. A small nodule was removed from beneath the chin three weeks after the operation. There was present œdema of the arm. Recovery. No recurrence two months after the operation. Reference, *New York Medical Journal*, 1891, Vol. i, p. 57.

CASE XXXVI (1891).—Ochsner. Female, aged nineteen. Sarcoma of humerus. Interscapulo-thoracic amputation: recovery. No recurrence four years after operation. Reference, *ANNALS OF SURGERY*, Philadelphia, 1895, Vol. xxii, p. 736.

CASE XXXVII (1891).—E. Monod. Male, aged twenty. Periosteal sarcoma of humerus with involvement of the muscles. Interscapulo-thoracic amputation: recovery. Recurrence in the lungs in three months. Reference, *Bulletin de la Société de Chirurgie*, 1891, Vol. xvii, p. 201.

CASE XXXVIII (1891).—Frederick Treves. Female, aged forty-three. Round celled sarcoma of the upper part of the right humerus, involving the shoulder-joint and the deltoid muscle. Interscapulo-thoracic amputation: recovery. Left hospital on the twentieth day. No subsequent history. Reference, *Lancet*, London, 1891, Vol. ii, p. 1159.

CASE XXXIX (1891).—D.lorme. Male, aged twenty. Sarcoma of the head of the humerus. Interscapulo-thoracic amputation. Recovery. No further data. Reference, *Semaine Médicale*, 1892, 252.

CASE XL (1891).—Von Bergmann. Sarcoma of the humerus involving the muscles. Interscapulo-thoracic amputation: recovery. Death from recurrence shortly after the operation. Reference, Nasse.

CASE XLI (1891).—Von Bergmann. Sarcoma of humerus involving the muscles and subclavian vein. Interscapulo-thoracic amputation: recovery. Death from recurrence shortly after the operation. Reference, Nasse.

CASE XLII (1891, March 23).—Kenneth McLeod. Female, aged fifteen. Spindle-celled sarcoma, involving the right scapula, clavicle, and humerus. Arm œdematous. Right radial pulse weak. Three months' history. Interscapulo-thoracic amputation. Skewer method. Recovery. No subsequent data. Reference, *Indian Medical Gazette*, 1891, xxvi, p. 147.

CASE XLIII (1892).—Von Bergmann.—Cystic sarcoma of the humerus. Interscapulo-thoracic amputation: recovery. No recurrence one year after operation. Death from some unknown cause. Reference, Nasse.

CASE XLIV (1892).—Von Bergmann. Sarcoma of the head of the humerus. Interscapulo-thoracic amputation: recovery. No recurrence at the end of one year. Reference, Nasse.

CASE XLV (1892, June 17).—Francis J. Shepherd. Female, aged thirty-two. Chondrosarcoma. Four years before patient had suffered an injury to the shoulder. Since then pain had been a constant symptom. In March, 1890, a tumor at the upper extremity of the humerus was first noted. At the time of operating the shoulder-joint was fixed and surrounded by a tumor thirty inches in circumference. Interscapulo-thoracic amputation without removal of the clavicle. The subclavian artery was compressed against the first rib through an incision above the clavicle. Recovery. No recurrence noted up to the time of the patient's death, from some unknown disease, some time after the operation. Reference, *Maritime Medical News*, Halifax, 1894, Vol. vi, p. 394.

CASE XLVI (1893).—Von Bergmann. Circumscribed tumor of the head of the humerus. Interscapulo-thoracic amputation: recovered. Recurrence at the end of one year in muscles. Recurrence was operated upon. Final result unknown. Reference, Nasse.

CASE XLVII (1893).—Roth. Sarcoma of the head of the humerus. Interscapulo-thoracic amputation: recovery. No recurrence

up to two years. Reference, *Münchener medicinische Wochenschrift*, 1895, 940.

CASE XLVIII (1893, November 20).—W. W. Keen. Female, aged twenty. Myeloid sarcoma of the upper part of the humerus, scapula, and part of clavicle. Interscapulo-thoracic amputation. Air entered subclavian vein. Recovery. No recurrence up to May 10, 1894 (six months). Reference, *American Journal*, 1894, Vol. cvii, p. 703.

CASE XLIX (June 1).—A. J. Ochsner. Male, aged forty-six. Enchondrosarcoma with colloid degeneration. Four months before operation there was noticed two hard nodulated tumors, one over the supraspinous fossa and one over the end of the clavicle. These doubled in size in the last five weeks. Interscapulo-thoracic amputation: recovery. No recurrence. In good health fifteen months after the operation. Reference, *ANNALS OF SURGERY*, Philadelphia, 1895, Vol. xxii, 736-742.

CASE L (1894, December 26).—W. W. Keen. Male, aged twenty-one. Sarcoma extending from the shoulder to the base of the neck, attached to both clavicle and scapula. Surface ulcerated. Shoulder-joint still somewhat movable. In May, 1893, had had a fracture of the clavicle. In June, 1895, a tumor at the site of the old fracture was removed by Dr. Stout, of California. This immediately recurred. For one month previous to Dr. Keen's operation the patient had been under the care of Dr. Coley, of New York, for treatment by the toxines of erysipelas and prodigiosus, without obvious benefit. Interscapulo-thoracic amputation: recovery. No recurrence. Was in good health February 4, 1895 (two months). Reference, *ANNALS OF SURGERY*, Philadelphia, 1895, Vol. xxi, 715-718.

CASE LI (1894).—Dubar. Male, aged twenty-seven. Osteosarcoma of upper extremity of humerus. Interscapulo-thoracic amputation: recovery. Recurrence at the end of four months. Reference, "Statistique opératoire," Lille, 1897, 163.

CASE LII (1895, January 12).—G. E. Armstrong. Female, aged thirty-four. Sarcoma. Two years before, patient had fractured left humerus during an eclamptic seizure. Before the splints applied for this were removed, there appeared a small, hard, painless tumor in the anterior part of the axilla. This disappeared in about one year, but the shoulder has been more or less stiff since. In August, 1894, she again injured the shoulder, which rapidly became swollen and painful. Two months prior to the operation a nodulated tumor appeared over the anterior part of the shoulder. The joint became fixed. There

was egg-shell crepitation. Aspiration showed a reddish-brown gelatinous fluid. Interscapulo-thoracic amputation. No hæmorrhage. No shock. Recovery. Discharged in seventeen days. No recurrence up to December 27, 1895 (eleven months). Reference, *Montreal Medical Journal*, 1895 and 1896, Vol. xxiv, 666.

CASE LIII (1895).—Roth. Sarcoma of the humerus. Interscapulo-thoracic amputation: recovery. No details. Reference, *Münchener medicinische Wochenschrift*, 1895, 940.

CASE LIV (1895).—Dirksen. Male, aged thirty-four. Large fluctuating tumor of humerus. Interscapulo-thoracic amputation: recovery. Reference, *Berliner klinische Wochenschrift*, 1895, 1044.

CASE LV (1895).—Von Bergmann. Sarcoma of the head of the humerus. Interscapulo-thoracic amputation: recovery. Reference, Nasse.

CASE LVI (1895).—G. Houzel. Female, aged forty-three. Osteosarcoma of the right shoulder and upper third of the humerus. Interscapulo-thoracic amputation: recovery. No recurrence three and a half years after the operation. Reference, *Archives Prov. de Chirurgie*, 1896, No. 1, p. 13.

CASE LVII (1896, February 13).—A. T. Cabot. Male, aged twelve. Round-celled sarcoma of the scapula, involving the soft parts about the shoulder. Interscapulo-thoracic amputation: recovery. Injections of the toxins of the streptococcus of erysipelas and of the bacillus prodigiosus were practised for three weeks. Three months after the operation several bulbous outgrowths of the ends of the cervical nerves were removed. There was no recurrence at that time. Recurrence in the brain five months after operation. Death a few weeks later. Reference, Boston *Medical and Surgical Journal*, 1896, Vol. cxxxv, 411.

CASE LVIII (1896, March).—H. C. Cameron. Male adult. Spindle-celled sarcoma. Thirteen months before the operation there was noticed a movable tumor in the axilla, which grew rapidly. This was lanced, resulting in profuse hæmorrhage, following which, at intervals, there were repeated hæmorrhages. Interscapulo-thoracic amputation: recovery. Nine weeks after operation a neuroma of the severed cords of the brachial plexus was discovered. A bad prognosis was entertained. Cameron said that he "would not be surprised to find a secondary development in the lungs." Reference, *Glasgow Medical Journal*, 1896, Vol. xlv, p. 302.

CASE LIX (1896, May 31).—E. F. Elliot. Female, aged seventy-five. Myxosarcoma of the scapula and soft parts around the shoulder.

On September 24, 1892, a small tumor was removed from the scapula. This recurred, and was again removed two weeks later. Since then it had recurred and been removed twelve times. Interscapulo-thoracic amputation: recovery. No recurrence four and a half months after the operation. Reference, *Lancet*, London, 1896, Vol. ii, 1304.

CASE LX (1896).—Schwartz. Female, aged twenty. Osteofibróchondroma of the upper part of the humerus. Interscapulo-thoracic amputation: recovery. No recurrence when last seen, some months after the operation. Reference, Personally communicated by the operator to Berger, *Société anatomique*, July, 1897.

CASE LXI (1896).—Alexander Posadas. Female, aged fifteen months. Osteosarcoma of the humerus, shoulder, and forearm. This was first noticed, six months before operation, as a painful, movable tumor in the soft parts on the antero-internal aspect of the shoulder. This is the youngest case to be found in the literature. Interscapulo-thoracic amputation: recovery. No recurrence seven months after the operation. Reference, *Revue de Chirurgie*, 1897, No. 10, p. 805.

CASE LXII (1896, November 16).—R. Steer Bowker. Male, aged sixteen. Sarcoma. This was a globular swelling of the left shoulder-joint and upper arm, restricting the movements of the joint. It had been present for four months. There was a history of repeated blows over the shoulder. Interscapulo-thoracic amputation: recovery. Slight infection. No further data. Reference, *Australian Medical Gazette*, Sydney, 1897, Vol. xvi, p. 13.

CASE LXIII (1897).—Quénu. Male, aged fifty-seven. Round-celled sarcoma of the head of the humerus. Interscapulo-thoracic amputation: recovery. Death four months later from recurrence. Reference, Personally communicated by the operator to Berger, *Société anatomique*, March, 1897.

CASE LXIV (1897).—Kirmission. Male, aged ten. Spindle-celled sarcoma of the upper extremity of the humerus, involving the subclavian vessels. Interscapulo-thoracic amputation: recovery. Death seven months later. Reference, Personally communicated by the operator to Berger.

CASE LXV (1897).—Paul Berger. Male, aged twenty-eight. Myxoma of the humerus. Involvement of the glands at the time of the operation. Interscapulo-thoracic amputation: recovery. No recurrence eighteen months after the operation. Reference, *Berger Revue de Chirurgie*, 1898, No. 10, p. 875.

CASE LXVI (1897).—Rochet. Male, aged twenty-eight. Small

celled osteosarcoma of the diaphysis of the humerus. Interscapulo-thoracic amputation: recovery. Reference, *Société de Chirurgie de Lyon*, 1897-98, No. 2, p. 57.

CASE LXVII (1898).—M. Barling. Male, aged fifty-three. Myeloid sarcoma, involving two-thirds of the right arm, the shoulder-joint, the outer end of the clavicle, the spine of the scapula, filling the axilla, and extending under the pectoral muscles. Three and a half years before there had been a spontaneous fracture of the humerus. Interscapulo-thoracic amputation: recovery. Multiple metastases six months later. Reference, *British Medical Journal*, 1898, Vol. i, p. 883.

CASE LXVIII (1898).—M. Barling. Male, aged thirty-seven. Periosteal sarcoma of seven months' duration, involving the upper two-thirds of the arm and encroaching upon the shoulder. Interscapulo-thoracic amputation: recovery. Complicated by a severe attack of pneumonia. No recurrence fifteen months after operation. Reference, *British Medical Journal*, 1898, Vol. i, p. 883.

CASE LXIX (1898, January).—C. B. Porter. Male, adult. Malignant disease (recurrence in scar, above elbow, and in glands of axilla). Nineteen years before there had been a tumor of the base of the thumb. This was incised and curetted from time to time. It finally involved the whole hand. The forearm was amputated three and one-half months before the present operation. Interscapulo-thoracic amputation: recovery. No recurrence two weeks after the operation. Reference, *Boston Medical and Surgical Journal*, 1898, Vol. cxxxix, p. 389.

CASE LXX (1898, July).—Russell S. Fowler. The history of the case operated upon by myself is as follows: E. S., housewife, fifty-one years of age, born in Germany, was admitted to the Brooklyn Hospital, service of Dr. George Ryerson Fowler, July 22, 1898. The patient was referred to the hospital by Dr. Burr Mosher, with the diagnosis of osteosarcoma of the humerus.

Previous History.—There was no history of injury. One year and a half before admission to the hospital the patient had noticed a gradually increasing swelling, situated a few inches above the left elbow. There was at first no inconvenience attached to this. Soon, however, the swelling began to increase rapidly. The arm became painful. This pain was worse at night. She consulted her physician, who attempted the local removal of the growth. Following this she was free from recurrence for about six months. The tumor then recurred. The overlying skin became ulcerated. From this time on

the patient lost considerably in weight and strength, and on account of the severe pain was unable to move the arm. She finally consulted Dr. Mosher, who referred her to me.

Condition on Admission.—The patient was an undersized German woman, thin, and anæmic. Her left arm was useless and supported by a sling. There was a tumor, the main part of which was as large as an orange, connected with the shaft of the humerus a few inches above the elbow. This tumor merged into the shaft above, and below involving approximately two thirds of the shaft of the bone. The most prominent portion presented antero-internally. Over this the skin was ulcerated. The triceps muscle was also the seat of the disease, which was evidently rapidly extending along the fascial planes to the shoulder region. It was impossible to state definitely the limits of the disease. Palpably no disease could be made out above the junction of the middle with the upper third of the bone. The axilla of this side was more resistant than that of the other side, but no definite tumor could be mapped out. The case was diagnosed as a rapidly extending osteosarcoma of the shaft of the humerus, with fascial and glandular involvement by extension. In view of the rapidity of the growth, the manner of progression along the triceps, the possibility of involvement of the scapular and shoulder regions, although no palpable disease was present in the latter two, I deemed it advisable to remove the entire upper extremity. Careful examination of the chest and abdomen failed to show any visceral involvement. The case was evidently one in which an extensive operation held out a good prospect of cure.

Operation.—This took place the day after admission. The delay of a day was obligated by the necessity of thoroughly cleansing the parts. The duration of the operation was an hour and twenty minutes. Fifteen ounces of ether were used. The time employed was far in excess of that which is usually necessary. This was because of the wretched manner in which the patient took the anæsthetic. It was necessary to stop the administration of the anæsthetic at times, and resort to the administration of oxygen, repeated hypodermics of whiskey and strychnine and artificial respiration.

Step 1.—An incision was made down to the periosteum covering the middle third of the clavicle. The periosteum was elevated. A chain-saw was passed around the junction of the inner with the middle third of the bone, and the clavicle sawn through. The outer two-thirds of the bone were dislocated outward and upward. The underlying periosteum was carefully incised and the subclavian vessels

identified. It was at this point in the operation that the patient's condition first became alarming. The pulse became so feeble that the pulsations of the subclavian artery were barely perceptible. This necessitated some little delay. Happily, with the withdrawal of the anæsthetic and the administration of several hypodermics of whiskey, the condition of the heart improved. The subclavian artery and vein were surrounded by catgut ligatures, the artery being tied first and then the vein. Two ligatures were applied to each and the vessels cut between the ligatures. There was some difficulty in securing the vein, as a large tributary vein tore between the points of ligature. This bled sufficiently to obscure for the moment the field of operation and necessitate the application of an additional ligature.

Step 2.—An incision, beginning at the middle of the primary incision, was curved downward, well in front of the axilla, to the border of the latissimus dorsi, thence upward over the body of the scapula to the end at the middle of the primary incision. This was deepened throughout down to the muscular layer. The pectoralis major and minor were sectioned, the brachial plexus cut at a level with the subclavian artery and vein. The skin and subcutaneous tissue were reflected from over the scapula. Here again the patient's condition became alarming. The arm was rapidly disarticulated at the shoulder-joint so that, in case of need, dressings could be applied, and the operation concluded at a second sitting. Happily, again the patient rallied. The scapular muscles were cut, a clamp placed upon the suprascapular artery and vein, and the scapula rapidly removed. The suprascapular vessels were ligated. The large wound resulting was carefully cleansed of all fat and *débris*, the edges of the wound approximated with silkworm-gut sutures, and a large dressing was applied. There was no indication for drainage, so none was used. Hæmostasis had been perfect. During the operation the only blood lost was that from the torn tributary vein while trying the subclavian. The patient rallied splendidly from the operation. There was no shock. The bad symptoms present during the operation were due entirely to the anæsthetic. The dressing was not changed until the seventh day, when the sutures were removed. The progress to recovery was uneventful, except for a slight skin infection from a suture at the upper angle of the wound. The patient was discharged on August 21, 1898.

Pathologist's Report.—The gross appearance of the growth suggested osteosarcoma, and the microscope confirmed this. The soft parts up to and above the level of the shoulder-joint were infiltrated

with sarcomatous tissue, not palpable, but shown by the microscope. The axilla was also the seat of sarcomatous infiltration. The operation had gone wide of the disease. This report satisfied me that the patient had a fair chance for final cure.

Final Result.—One year after the operation I examined the case. There was no evidence of recurrence. The patient had gained greatly in weight and strength. No prothesis was used, as the patient objected to it. More recently I have heard that she still continues in good health.

CASE LXXI (1899).—George Ryerson Fowler (here first fully reported). F. S., by occupation a farmer, seventy-five years of age, a native of France, was admitted to the Brooklyn Hospital June 12, 1899, with the following history. There had been pain in the shoulder and elbow for one year. There was no history of injury. During the last three months the arm had become swollen, tense, red, and painful on pressure. A tumor had appeared on the anterior border of the axilla about the same time that the arm began to noticeably increase in size. When admitted, the tumor in the axilla had broken down and was discharging pus. The arm was much swollen, being largest just above the elbow. The skin had ulcerated at this point. A profuse discharge escaped through the ulceration. It was decided to first remove the infected mass from the axilla and from beneath the pectoral muscles. This was done on June 13. The anæsthetic was taken rather badly. Examination by the microscope proved the tumor to be an alveolar carcinoma. Six days later the patient was again anæsthetized, the wound having in the mean time become clean, and interscapulo-thoracic amputation performed. The clavicle was first sawn through at the junction of its inner and middle third. It was then elevated and the subclavian artery tied. Following this the extremity was quickly and easily removed. The hemorrhage in this case was not excessive, though more blood was lost than is common in such operations. The entire wound, with the exception of the lower angle, was closed with silkworm gut. A plain gauze drain was employed. The patient rallied from the shock of the operation, but this, together with an organic lesion of the heart, caused his death the next day.

CASE LXXII (1899, April 12).—Le Conte, Philadelphia. Male, aged forty-nine. Sarcoma. The tumor had been in existence for three and one-half years. It had twice been removed locally, the last time by Dr. Ashhurst, who removed with it one-fifth of the clavicle and all of the acromion process. This was in May, 1897. Inter-

scapulo-thoracic amputation. At the time of this operation the overlying skin had ulcerated. Recovery. When reported, the wound had not healed. Reference, *ANNALS OF SURGERY*, 1899, Vol. ii, p. 260.

ANALYSIS OF THE PUBLISHED CASES.

Variety of Tumor.—Fifty-eight of these cases were sarcomata; four (Nos. VI, XIV, XXIX, LX) belong to the chondromata; three (Nos. II, IV, V) were encephalomata; two (Nos. I, LXIX) were "malignant tumors;" one (No. LXXI), alveolar carcinoma; one (No. LXV), myxoma; one (No. XII), "rapidly growing tumor;" one (No. XLVI), circumscribed recurrent tumor; one (No. LIV), "large, fluctuating tumor." Of the sarcomata group, thirteen (Nos. III, VII, VIII, XVII, XVIII, XXIII, XXVI, XXXIII, LI, LVI, LXI, LXVI, LXX) were osteosarcomata; three (Nos. X, XLV, XLIX), chondrosarcomata; six (Nos. XI, XV, XXIV, XLII, LVIII, LXIV), spindle-celled sarcomata; one (No. LIX), myxosarcoma; one (No. XX), fibro-sarcoma; two (Nos. XLVIII, LXVII), myeloid sarcomata; one (No. XXI), mixed-celled periosteal sarcoma; four (Nos. XXXI, XXXVIII, LVII, LXIII), round-celled sarcomata; one (No. XXXIV), encapsulated periosteal sarcoma; two (Nos. XXXVII, LXVIII), periosteal sarcomata; one (No. XLIII), cystic sarcoma; twenty-three (Nos. IX, XIII, XVI, XIX, XXII, XXV, XXVII, XXVIII, XXX, XXXII, XXXV, XXXVI, XXXIX, XL, XLI, XLIV, XLVII, XLVIII, LII, LIII, LV, LXII, LXXII) are reported simply as sarcomata.

Mortality.—Of these seventy-two cases, eight cases died; that of McLeod (No. V) of hæmorrhage and shock. This patient was but two years of age, and the tumor an enormous one. Thiersch's (No. VI) of œdema of the lungs and empyema, in five days. Fergusson's (No. VII) of shock, in four days. This case had a fatty heart. Von Langenbeck's (No. IX) of secondary hemorrhage, on the fifth day. Macnamara's (No. X) of shock, on the following day. McGill's (No. XII) of infection, on the sixth day. Parkes's (No. XXX) of shock, in fifty-six hours. Fowler's (No. LXXI) of shock, on the following day. This case had mitral regurgitation and took the anæs-

thetic badly. This brings the mortality of the primary operation up to $11\frac{1}{9}$ per cent. This is more than twice the mortality conceded by Berger. Von Bergmann's fatal case has been placed in the unclassified list of cases, as the operation was a much more extensive procedure than interscapulo-thoracic amputation. It does not seem to me that 11 per cent. is too high a mortality for this operation.

Dr. Stephen Rogers, in 1869 (*New York Medical Journal*), published a table of sixty-four operations for partial or complete excision of the scapula. Of these fifteen included removal of the arm and part or all of the clavicle. The mortality in these latter cases was 20 per cent.

Lewis's analysis (*ANNALS OF SURGERY*, 1890, Vol. xi, p. 91) of Berger's first list of fifty-one cases, twenty-six cases not mentioned by Ashhurst, shows a mortality in traumatic cases of 30 per cent., and of about 20 per cent. in those cases where the interference is on account of malignant disease. Butlin's mortality for amputation at the shoulder-joint (twenty-four cases) was $33\frac{1}{3}$ per cent. This comprised cases occurring between 1867 and 1887. Of fourteen cases, occurring between 1877 and 1887, the mortality was $28\frac{1}{2}$ per cent. Of twenty other cases collected by the same author, the mortality was 25 per cent. Barling (*Clinical Society of London*) collected nineteen cases recorded since 1890. All recovered. Interscapulo-thoracic amputation was performed eight times at the Birmingham Hospital, all the patients recovering from the operation.

Ashhurst, in 1895, tabulated thirty-nine cases, in which interscapulo-thoracic amputation had been done for various lesions. These, in addition to the fifty-one cases tabulated by him in 1881, make a total of ninety cases. It is to be remembered that this list includes cases operated upon for extensive traumatism as well as those done for malignant growths. Taking all cases, it is found sixty-six of these are known to have recovered, while twenty-two are known to have terminated fatally. This gives a mortality of $24\frac{2}{3}$ per cent. for all of the eighty-eight cases. In the series of 1895, thirty-nine cases, the result in two is unknown, twenty-eight recovered, and nine died, making a mortality of 24.3 per cent. In the series of

1881, comprising fifty-one cases, there were thirty-eight recoveries and thirteen deaths, making a mortality of 25.5 per cent. All statistics of this kind are valueless, as the mortality of the operation varies greatly according to the lesion for which it is done, injury giving a high mortality, malignant disease a comparatively low mortality, when the operation is done primarily. Ashhurst gives a mortality of 37.7 per cent. in 1387 cases (table published in 1881) of amputation at the shoulder-joint for various lesions. ("International Encyclopædia of Surgery," vol. xiii, p. 647.)

In an address before the Surgical Congress in Berlin, June 4, 1888, Professor George Adelman presented, in tabulated form, sixty-seven cases in which the arm, scapula, and part or all of the clavicle had been removed at various times and for various reasons. There were three cases of gunshot injury, all of which recovered; seven cases of comminuted fracture, two of which recovered and five died; four cases of tearing accidents, which recovered; two cases of caries and one of osteomyelitis, two of which were cured. Fifty cases were operated upon for tumor: twenty-six cases of sarcoma; seven cases of chondroma, with three recoveries and four deaths; four cases of encephaloma, in two of which the time was too short to judge of their cure and two of which died, one from recurrence and one from shock. Of these fifty operations, in twenty-five the operation was primary interscapulo-thoracic amputation; ten of the twenty-five cases recovered (four of these ten are doubtful) and fifteen died. The operation was performed nineteen times in two sittings, with ten recoveries (two of which are doubtful) and nine deaths. Four cases were operated upon three times each, with three recoveries and one death. Two cases were operated upon six times each, one recovered and one died from recurrence. Of the entire fifty, twenty-four recovered and twenty-six died.

In forty-six cases collected by Berger, there were but two deaths from the operation. One of these (Kenneth McLeod's) was an infant of two years, with an enormous tumor of the shoulder. Death occurred immediately after the operation. The severity of such an operation in one so young was the

probable cause of death, though Posadas has operated by this method with success in a child of fifteen months. The other death occurred in one of Bergmann's cases, operated upon in 1889. The disease, sarcoma, was very extensive, necessitating resection of the first rib and sternum, and the excision of the subclavian vein and ligature of the right brachio-cephalic trunk, which was completely involved by the disease. The patient died two hours following the operation.

Final Results.—As previously stated, eight cases (Nos. V, VI, VII, IX, X, XII, XXX, LXXI) died as a result of the operation. No data regarding the final result is given in thirteen cases (Nos. XI, XIII, XVI, XXVIII, XXXII, XXXVIII, XXXIX, XLII, LIII, LIV, LV, LXII, LXVI). Two cases (Nos. XV, XLV) died of intercurrent disease before a year had elapsed. Sufficient time has not been allowed to elapse before reporting in eighteen cases (Nos. IV, XX, XXIII, XXIV, XXV, XXVII, XXXI, XXXIII, XXXV, XLVIII, L, LII, LVIII, LIX, LX, LXI, LXIX, LXXII). One case (No. LI) recurred at the end of four months, but the final result is not noted. This one probably died shortly after. One case (No. XLVI) recurred and was reoperated upon, but the final result is not noted. Eleven cases (Nos. I, II, XVIII, XIX, XXXVII, XL, XLI, LVII, LXIII, LXIV, LXVII) recurred, and death ensued in about six months following the operation. Three cases (Nos. XXI, XXII, XXVI) died from recurrence in about twelve months following the operation. One case (No. VIII) died from recurrence eighteen months after the operation. The remaining fourteen cases (Nos. III, XIV, XVII, XXIX, XXXIV, XXXVI, XLIII, XLIV, XLVII, XLIX, LVI, LXV, LXVIII, LXX) were well at the time when reported, one year or over after the operation.

For statistical purposes regarding ultimate cures only those cases may be used in which the final result is known, or which have been free from the disease for a longer period than one year. We cannot use the eight cases that died, for no one can say whether they would have escaped recurrence or not had they survived the operation. The thirteen cases which lack data cannot be used for this purpose; nor can the eighteen

cases be used in which sufficient time had not been allowed to elapse before they were reported. The two cases which died from intercurrent disease before a year had elapsed are not available; nor the case which recurred and was reoperated upon, but in which the final result is not noted. There remain thirty cases, sixteen of which died from recurrence, and fourteen of which were alive and well when reported one year and over following the operation. We may then, if these statistics are to be trusted, place the percentage of ultimate recoveries at 46 $\frac{2}{3}$.

Of the fourteen cases regarded as cured, three cases were well and free from recurrence one year after the operation: No. XXIX, Chavasse (1889); No. XLIV, von Bergmann (1892); No. XLIII, von Bergmann (1892); this last case of von Bergmann's died of an unknown cause shortly after the year had elapsed; three cases were free from recurrence at the end of fifteen months; No. XLIX, Ochsner (1894); No. LXVIII, Barling (1898); No. LXX, Fowler (1898); one was well at the end of eighteen months; No. XLV, Berger (1897); one at the end of two years; No. XLVII, Roth (1893); one at the end of three years; No. XVII, Heath (1883); two at the end of three and a half years; No. XXXIV, von Bergmann (1889); No. LVI, Houzel (1895); one at the end of four years; No. XXXVI, Ochsner (1891); one at the end of nine years; No. III, Mussey (1845); one at the end of fifteen years; No. XIV, Berger (1882).

It is interesting to note the disease present in these cases: Eleven were cases of sarcoma, two were enchondromata, and one a myxoma. The only case reported as cured in which there is a doubt of the malignancy of the growth is that of Chavasse. In the discussion of this case before the Royal Medical and Chirurgical Society Mr. Adams stated that it looked to him like a simple chondroma. Deducting this case from the cases reported cured, leaves 45 per cent. of permanent cures following primary interscapulo-thoracic amputation for malignant disease.

Of the forty-four cases collected by Berger, in addition to the two successful cases of his own, thirteen cannot be utilized by reason of the lack of data relating to their final outcome.

These are the cases reported by Syme, Lund, two of Bergmann's cases; those of Küster, Treves, Delorme, Ochsner, Dircksen, Hall, the second case of Roth, and that of Rochet. In fourteen other cases recurrence took place or death by metastasis occurred at a longer or shorter interval following the operation. Local inoperable recurrences were noted in three of Bergmann's cases; in those of J. Boeckel, Dubar, Quénu, Kirmisson; immediate multiple metastasis in the case of Verneuil, May, E. Monod, in two of Bergmann's cases, and in one of Barling's cases; in four of the above the metastasis occurred in the lung; in those of May the metastasis was glandular. The longest period before recurrence in these cases was ten to fifteen months. In almost all of them, at the time of operation, there was involvement of the muscles in the neighborhood of the scapulo-humeral articulation; in some of the muscles of the scapula, and in some the axillary vein itself, was involved. Of these forty-four cases twenty-eight are useless for our purpose. In seventeen cases cure was confirmed respectively at the end of four months (Parkes). (In verifying this case I find that six weeks are given by Parkes as the last time the patient was seen), six months (Christopher Heath), eight months (May, van Iterson, Lewis, Posadas), nine months (Sondermayer), one year and over (Madelung, Chavasse, two cases of Bergmann's, Berger, Barling), two years (Roth), almost three years (Houzel), three years and six months (Bergmann), fifteen years (Berger), and, lastly, several months without more definite information (Schwartz). There are then ten cases (33 per cent.) which were without recurrences one year or more following the operation.

In addition to the cases in which typical interscapulo-thoracic amputation has been primarily done I have collected five in which the clavicle was not removed. These I have designated as *atypical interscapulo-thoracic amputation*. Two of these cases are incorrectly included by Berger in his table of 1898,—*i.e.*, Hall, 1896, and Bergmann, 1886. In one of these cases, that of Esmarch, neither the immediate nor final result is noted. The other four recovered from the operation. In one no data concerning recurrence is noted. Three cases

died from recurrence respectively at the end of three and a half months, fifteen months, and two years, in each case the metastasis being in the lung. The effect of adding these cases to the table of typical cases would result in slightly lowering the mortality, and would at the same time lower the percentage of ultimate cures from $46\frac{2}{3}$ to $42\frac{2}{5}$.

(II) CASES OF ATYPICAL INTERSCAPULO-THORACIC AMPUTATION
WITHOUT REMOVAL OF THE CLAVICLE.

CASE LXXIII (1874, July 8).—Esmarch, Kiel. Male, aged fifty. Myxosarcoma of right axilla. Atypical interscapulo-thoracic amputation: recovery (?). This tumor had been present for five months. The subclavian vessels were ligated preliminarily. No date regarding the final result. Reference, Friedr. Heydenreich, "Ueber Exstirpation der Scapula," Inaugural Dissertation, Kiel, 1874.

CASE LXXIV (1883).—R. Barwell, London. Malignant tumor. Atypical interscapulo-thoracic amputation: recovery. Death from recurrence in two years. The recurrence was both local and metastatic in the lungs and liver. Reference, *British Medical Journal*, 1884, Vol. i, p. 412.

CASE LXXV (1886, July 15).—Von Bergmann, Berlin. Male, aged forty-four. Sarcoma of the humerus with involvement of the axillary glands. The growth had been present for six months. Atypical interscapulo-thoracic amputation. Preliminary ligation of the subclavian vessels. Recovery. Death from recurrence in the pleura and lung, November, 1887. Reference, Bramsfeld, "Dissertation."

CASE LXXVI (1887, February 6).—Obalinsky, Krakau. Female, aged twenty-two. Sarcoma. Atypical interscapulo-thoracic amputation: recovery. Death in three and one-half months from recurrence in the pleura. The subclavian vessels were ligated preliminarily. Reference, *Wiener medizinische Presse*, 1887, No. 19, p. 640.

CASE LXXVII (1896?).—G. C. Hall. Male, adult. Sarcoma of the shoulder region. The tumor was of enormous size; the skin over it was ulcerated; there was no attachment to the thorax. Berger reports this as a case of the complete operation, but the photograph in the original shows the clavicle *in situ*. Atypical interscapulo-thoracic amputation: recovery. No data concerning recurrence. Reference, *Lancet*, London, 1896, Vol. i, p. 353.

(TO BE CONTINUED.)

NOTE ON MORTALITY AFTER OPERATION FOR LARGE INCARCERATED HERNIÆ.

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I MAKE the following report of two fatal cases of hernia, since the lesson to be derived therefrom must prove of exceptional value at the present time, when most cases, no matter how large, of old retained hernia are considered operable.

May 20, 1894, I assisted my friend Dr. John C. Irish, of Lowell, in the following operation :

W. T. B., aged forty-five, had been admitted to the Lowell General Hospital because of an enormous inguinal hernia of the left side. He had been for some time under observation, and an operation was deemed unavoidable, because of the extreme tenuity of the enveloping structures. The integrity of the lower portion of the sac was endangered by the necrosis of the skin, presenting the appearance of a slowly spreading ulcer. The man was of good habits, in good general health, and easy circumstances. He had lived a sedentary life from choice, as also during the later years from necessity. Over six feet in height, he weighed 250 pounds, yet did not seem excessively corpulent.

The abdomen, on the contrary, was comparatively thin, with a marked retrocession below the umbilicus. When standing, the tumor extended nearly to the knee, and its largest circumference measured twenty-seven inches. The operation was performed in St. Joseph's Hospital, with the assistance of Dr. M. G. Parker and the other members of the staff.

The contents of the hernial tumor consisted of the larger portion of the large intestine with many fatty epiploicæ and several feet of the small intestine. The extraordinary anatomical feature was the extreme thickness of the mesentery of the large intestines, which presented a fatty infiltration, by estimate more than two inches in thickness. On this account it became necessary to divide the greatly enlarged ring

upward nearly to the crest of the ilium. There were no adhesions of importance to the sac, the intestines had been well emptied, and were of normal color and appearance. The patient was placed in the Trendelenburg position, the abdominal wound was held well apart with retractors, and, little by little, the reposition of the intestines was effected. The small intestines were easily returned, together with a considerable portion of the large bowel. The parietal wall of the abdominal cavity did not appear to be unduly rigid, and, little by little, relaxed to receive the displaced organs. The great difficulty was now found to be the restoration of the thickened mesentery, which, after much resistance, suddenly yielded, and the contents of the hernial tumor were completely reduced.

The reduction of the mass was difficult for two reasons. First, because of the lack of storage capacity of the abdominal cavity; secondly, because of the peculiar anatomical condition of the mesentery, already referred to. The abdominal wound was closed in layers, as usual, by buried tendon sutures, and the wound sealed with iodoform collodion without drainage.

Almost immediately upon the reduction of the mass, the respiration became shallow and rapid, with a rather small, rapid pulse. The abdomen seemed unduly distended. Soon after coming out of the ether, the patient began to cough, and expectorated a frothy, bloody mucus, which continued to be the most marked objective symptom until his death, thirty-two hours after the operation. There were no especial symptoms referable to the abdominal organs.

CASE II.—T. B. L., aged fifty-six, of Ogden, Utah, was referred to me by Drs. E. C. Rich, of Ogden, and E. R. Lewis, of Kansas City. He was born in St. Louis, of healthy parents. Since graduation from college had devoted his life to educational work. Never sick or disabled save from hernia of the right inguinal variety. Six feet two inches in height, not over fat, yet weighs 325 pounds. Noted for exceptional physical strength and development. First noticed hernia in 1882, attributed to excessive exertion from horseback-riding in the mountains. The hernia could not be retained by a truss, and soon became scrotal. It was reducible until 1891. At this time it was about half the present size. Has been retained in a suspensory bag supported from the shoulders. First strangulation occurred in Salt Lake City in 1884, again in 1885. Both times it was reduced with the greatest of difficulty. Not strangulated since 1886, but has increased slowly in size up to the present time. He is a great sufferer in every position of the body, oftentimes comparatively little relieved

by being in bed. Notwithstanding the enormous size of the tumor, the intestinal function is comparatively little impaired. The body is well nourished, muscles exceptionally well developed. The abdomi-



Scrotal tumor measuring fifteen inches from base to pubic bone.

nal wall thickened from fatty deposit. When standing, the scrotal tumor reaches nearly to the knee.

Measurements.—In median line the base of the tumor from the

pubic bone, fifteen inches; to the penial opening, five inches; from penial opening to base, ten inches.

Transverse Measurement.—Just below the pubes, twelve inches; four inches below, the narrowest part, eight inches; at the widest part, ten inches. Circumference at base, body attachment, twenty-seven inches; at its largest part, twenty-nine and one-half inches. From pubis to pubis, around the tumor, thirty-two inches. When standing, the entire tumor distinctly pulsates, which can be clearly seen at ten feet distant. For years the penis has been fused in the mass, the opening to which is marked by a deep dimple in the tumor. The right testicle is seen on the surface of the tumor, about six inches below the pubis. Weight of tumor estimated at forty pounds.

Admitted to my hospital July 9, 1899. Put to bed with foot of the bed elevated. Moderate doses of saline cathartics acted readily upon the bowel, inducing a mild diarrhœa. Only beef-tea was administered for thirty-six hours prior to the operation. The chief difficulty apprehended was the want of space in the abdominal cavity for the displaced organs. Retention in bed caused a considerable diminution in size of the tumor, which was more or less resonant throughout. By elevation of the mass, under gentle pressure, the tumor was easily reduced to two-thirds its size when standing.

Keeping in mind the history of Case I, I advised a prolonged rest in bed under diet, to which the patient objected for a variety of reasons. Operation was therefore determined upon, which I performed the morning of July 12, assisted by Drs. Dow and Lockhart, of Cambridge, and Dr. McKechnie, of Somerville. Patient took ether easily, and respiration was unimpeded and undisturbed until after the replacement of the abdominal organs. He was placed in the Trendelenburg position. Incision was made over the tumor from a point opposite the penial opening, which was extended half-way to the crest of the ilium. This free opening readily exposed the contents of the sac. A wide portion of omentum, not much changed in consistency or character, was lifted upward, covering a nest of several feet of small intestine. Through the enlarged abdominal opening these were replaced almost by gravity. There remained nearly the entire large intestine with many fatty epiploicæ, with the mesentery infiltrated with fat, estimated to be fully two inches in thickness. The appendix was the largest I have ever seen, measuring nearly six inches in length, and quite the size of the index-finger.

Little by little the large intestines were restored, with considerable difficulty, to the abdominal cavity, the lower portion being the last

to be returned, and, when it finally yielded, it did so with a suddenness quite surprising.

We all immediately remarked the extraordinary distention of the abdominal cavity to aldermanic proportions, quite unexpected, although fully appreciating the enormous size of the tumor. However, the abdominal wall did not seem unduly tense. The omentum was now easily replaced and folded accurately over the readjusted intestines, and retained in position by a pad of gauze. There were only slight adhesions, one or two at the very base of the sac along the outer line of the inguinal ring. The sac was separated from the adjacent parts without much difficulty, sutured across its base, and removed. The testicle was enlarged to more than double its usual size with a most extraordinary elongation of the cord. On this account it was thought wise to remove it. From the point of division of the cord to the base of the testicle it measured twenty and one-half inches. The original opening was estimated to be about five inches in diameter, and this was enlarged so that the opening extended upward nearly on a line drawn from the umbilicus to the crest of the ilium.

The anatomical displacement of the structures was interesting. The fibres of the external oblique were easily traced two inches below the pubis, showing that the external abdominal wall had been displaced downward by the dragging weight of the tumor. The cremasteric fibres were developed to many times their normal size, and, before the completion of the operation, the contraction of the dartos was most remarkable. The omental apron, contained within the hernial sac, was estimated to measure twelve by fifteen inches, and possibly to weigh two pounds.

There were no bleeding vessels of importance, and there now remained simply a large opening in the abdominal wall for closure, as in a laparotomy. The abdominal wound was closed in layers by heavy sutures of kangaroo tendon and the wound sealed with iodoform collodion without drainage. A large well-formed penis now became normally apparent. The operation lasted a little more than an hour. Patient recovered comfortably from the ether without nausea, and was soon in normal consciousness. The respiration, however, which before had been about 16 per minute, rose at once to 40, and the pulse to 136. The temperature prior to the operation was normal, the reactive temperature, twelve hours later, was 102° F., when it slowly declined to an average temperature of about 100°.

The heart's action slowed down in proportion, averaging a little over 100 pulsations per minute, of fair quality until near the last.

The respiration, however, was out of proportion rapid, averaging quite 30 per minute.

Death occurred on the morning of the 20th, the ninth day after the operation. There was at no time much suffering, except from rapidity of respiration. The oxidation of the blood was not especially lessened, a mild catharsis was easily maintained by small doses of salines. There was never nausea, and digestion of small quantities of food, taken often, continued perfect. Sufficient sleep was obtained almost without medication. The urine was abundant and normal in character. The upper portion of the wound partly opened, owing to the tension. Patient continued bright, cheerful, and hopeful to the end. I thought him practically out of serious danger after the second day, notwithstanding the recognition of the greatly increased intra-abdominal pressure. At no time did the distention of the abdomen appear to be materially lessened. Death occurred rather suddenly, with only a few hours' premonition. Autopsy entirely negative. Peritoneal cavity was non-infected. Intestines were normally disposed and not unduly distended. The omentum had remained in its replaced position, and was firmly agglutinated to the abdominal wall at the site of the operation.

Although for many years especially familiar with the literature of operative measures for the cure of hernia, I do not recall any cases where operation has been attempted upon herniæ of such enormous size, or where the histories have been in any way comparable with those above given. It is on this account that I have reported these in more than ordinary detail.

I have operated upon many very large herniæ, every one of which, where the integrity of the intestinal canal has not been involved, made an easy recovery, with the above exceptions. Some of these might be considered enormous,—the larger one, where the tumor measured in circumference eighteen inches, and extended half-way down to the knee. This was probably fully as large as the average adult head. However, there was no disturbance of respiration or circulation.

In what way are we to determine that danger to life may be incurred because of the increase of intra-abdominal pressure, is the problem presented in the present paper.

Certainly, until a very recent date, this question was not likely to arise, since prior to the days of aseptic surgical technique operations of any sort were rarely advocated, unless life was endangered because of strangulation of the intestinal canal. Singularly enough, however, that remarkably clear-sighted surgeon of Paris, George Arnaud, who published his dissertation on hernia in 1748, narrates a case worthy of report in the present connection, together with his quaint comments on the same. ("Dissertation on Hernias or Ruptures, in Two Parts." By George Arnaud, p. 292.)

"Mr. Boudon recommended to my deceased father, a man of forty years of age, and of a very strong constitution. He was extremely fat and six foot and an inch in height, French measure. His name was Mr. Tregneux, was an inhabitant of Clamsey, in the diocese of Auxerre. He had an hernia from his infancy, which had never re-entered. It was thirty-two inches in circumference at its lowest part, nineteen at the ring, and sixteen in length. For more than ten years his penis had been lost in the bulk of the tumor, so that the preputium formed a kind of depression like that of the navel; so that in making water his urine was diffused over all the tumor, which was very troublesome to him. As he was a timber-merchant, his business obliged him almost every day to ride forty or fifty miles on horseback, which induced him to invent a large cavity in the fore-part of his saddle, in which he placed his tumor. Being at last reduced to such a condition that he could no longer follow his business, and being afraid that this disorder, no less terrible than insupportable, would soon put an end to his life, he determined to apply for relief. It was in 1726 that he was introduced to us. He found a great deal of comfort from the recent example which my father and I gave him, of the cure of a similar disorder. He submitted to everything we prescribed, either for his relief or radical cure; but on condition, said he, that he should have a little to eat; for he was a prodigious glutton. Persons of this kind may observe a very strict regimen, even by eating a little. We may therefore recede from the general rule in their favour, without any fear of doing harm; for their great appetite requires this kind of liberty. He was bled several times, then purged, and afterwards used twelve or fifteen baths. Twice a day I made strong embrocations of his abdomen with oil of melilot, and covered the whole tumor with a plaister composed of the emplastrum de vigo, prepared with a good

deal of mercury, of the diabotanium, and the mucilages, and this I renewed every four days. We made him every morning take ten, twelve, fifteen, or twenty grains of *mercur. dulc.* He drank plentifully, and had four emollient and purgative clysters injected every day. Every four days we purged him with cassia, with an intention to evacuate the humours, and prevent a salivation. This method succeeded very happily; for the evacuations lasted sixteen days, and were so copious that they every day redoubled the patient's astonishment.

“The tumor during this time had lost about three-quarters of its bulk, and more than a half of the remaining quarter we made to re-enter by taxis; so that the hernia, being thus reduced to one-eighth part of its bulk, was in a condition to be contain'd in the hollow cushion of a truss. It afterwards diminished insensibly for eight or ten days, during which time we took care to fill the cavity of the cushion, in proportion as the bulk of the tumor diminish'd. On the thirty-sixth day from the first venesection, the parts re-entered all together, and the testicle also. We then used a convex instead of the concave cushion. The patient in a very short time resumed his strength and flesh, and follow'd his business with a great deal more vigor than ever he had done. The first thing he did at his return home, was to make his wife pregnant, with whom he had had no amorous converse for ten years before. He quitted the use of the truss eighteen months after; that is to say, in 1728.

“Twelve years after, he had occasion to come to Paris, where he call'd for me immediately on his arrival, rather to testify his gratitude than for any other reason; but as I did not know him, he put me in mind of everything that had happen'd in 1726. I examin'd the parts, which I found so firm and solid, that one could have hardly imagined that he had formerly labour'd under an hernia. The skin of the scrotum was return'd to its natural state, only it was very thick; and the bottom of the scrotum which had approached to the ring on account of the herniary sac of the testicle, was fix'd or glew'd over the ring. This portion of skin seem'd to make a kind of stopper, which fill'd the cavity of it. But tho' the disorder had no appearance of a relapse, I order'd the patient to wear a truss by way of prevention: The reason of which I shall afterwards give in a particular instance. From this observation it is sufficiently evident, that what at first appear'd a paradox, is a truth easily perceived by persons of penetration: but as it may perplex the more ignorant and illiterate part of mankind, I shall, for their sake, render it still more intelli-

gible, by a method of reasoning as clear and perspicuous as I possibly can.

“The parts had insensibly accustom’d themselves to this new abdomen which nature had form’d for them: They had there fix’d a permanent residence for themselves, whence it was impossible for them to remove, on account of the adherences they had contract’d. Without the methodical assistance afforded it was impossible that they should ever of themselves have re-entered the abdomen: But by the disposition into which they were put, they were forced to resume their natural place, tho’ they were lean and emaciated, yet when they were reduced, they resumed their former bulk, in the same proportion as all the other parts of the body resumed their flesh. Now they could not slip out again, after they were once in the abdomen, because they were become larger than the diameter of the ring; so that the patient must necessarily have been cured long before he left off the use of the truss. The following fable applied to this subject will more sensibly enable us to comprehend what hinders these sorts of hernias from re-entering and what obliges them to remain in the abdomen, after they are reduced.

“Into a wicker cask, where corn was kept,
Perchance of meagre crops, a field mouse crept;
But when she fill’d her paunch, and sleek’d her hide,
How to get out again, in vain she try’d,
A weasel who beheld her thus disturb’d,
In friendly strain the luckless mouse address’d,
‘Would you escape, you must be poor and thin,
To pass the hole thro’ which you entered in.’ ”

HORACE, Lib. I, Epist.

I am quite sure that it is safe to arrive at the conclusion that, in both Dr. Irish’s case and my own, the fatal issue is to be attributed to the sudden marked increase of intra-abdominal pressure, especially unduly limiting the function of the diaphragmatic muscle. I think that the teaching of the wise Arnaud should be carried into effect, for a considerable period, before operative measures for the cure of such enormous herniæ should be undertaken.

I have reported the cases with much more than usual detail, since no author has made reference to danger which may arise from this cause. Where any very considerable portion of

the abdominal contents have been for a long time displaced, I think it is advisable to submit the patient to quite a period of retention in bed, with a limited diet and moderate purgation. A loss of 10 per cent. in weight may not be excessive, and this will mean not only by that ratio a less amount of abdominal contents present at time of operation, but that there will be a corresponding reduction in the hernial contents to be returned. In even a greater degree will the abdominal wall be thinned and relaxed. Little by little, during this prolonged period of treatment, the hernial tumor will lessen by a more or less spontaneous reduction of the parts, and the circulatory equilibrium also will become more nearly normal. I advise that these factors be taken into careful consideration in every case of old, very large retained hernia to be submitted to surgical treatment. I also think, with the exercise of such care, the conditions must indeed be very exceptional where the cure of hernia may not be safely effected. In a consecutive list of about 500 operations, undertaken by me for the cure of hernia, the case reported is the only one where the danger-line seemed to be approached when the integrity of the intestinal canal was not involved.

THE SURGICAL ASPECTS OF THE MODERN SMALL-BORE PROJECTILE.¹

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WITH the introduction of the Lebel rifle by France, in 1886, a new epoch was created in modern warfare and military surgery. The French example was soon imitated by other powers, until to-day every advanced nation has practically the same character of rifle.

Although thirteen years have elapsed since that date, and wars of more or less consequence have occurred, we are still short of sufficient data to enable us to reach complete and uniform conclusions as to the influence and effect which this new rifle is capable of creating.

With the improvement of the rifle, and the corresponding improvement of the projectile and explosive, we are able to drive a missile with more energy, more accuracy, and greater velocity; furthermore, the combatant enters the conflict with a greater number of cartridges, which can be fired with greater accuracy and rapidity than formerly. Under such circumstances, engagements were expected to occur at longer ranges. Dressing stations and hospitals to be removed to greater distances or to protected positions, greater number of wounded, and greater difficulties in the removal of not only a larger number of wounded, but removal under more difficult conditions.

Much has been promised for and much is expected of the small-bore projectile, but as to how thoroughly it will fulfil the expectations and demands yet remains to be determined.

¹ A paper read before the Mississippi Valley Medical Association, October 5, 1899.

The experimental efforts have been both numerous and various, but their conclusions lack the desired uniformity, at least, as regards certain specific features. This lack of uniformity in the experiments of Beck, Bruns, Reger, Delorme, Chavasse, Chauvel, and others, has prompted the Prussian War Office to undertake an elaborate series of experiments, with the view of reaching accurate conclusions as regards the new projectile. Practical results justify one in doubting as to whether the new projectile is a step forward or backward, when broadly considered from a humane as well as fighting stand-point. Here the attending circumstances must be considered. It largely depends upon whether the contending forces represent an advanced civilized nation or not. In the latter instance the new projectile has fallen short of the expectations. Certainly no stronger proof of this insufficiency could be desired than that furnished by the English government. The creation of the "Dum Dum" bullet is a positive confession that the new projectile does not fulfil the practical demands.

In the Chitral expedition, the English, armed with the "Lee-Metford" rifles, were clearly unable to stop the rush that was made upon them. Soldiers have been known to continue fighting after a half-dozen Lee-Metford bullets had passed through them. This experience resulted in the invention, by Captain Bertie Clay, R.A., of a soft-nose bullet known as the "Dum Dum."

The experience of the Italians in Abyssinia armed with the Carcano rifle was not different; not only were they easily defeated, but the Abyssinians indulged in humorous criticisms, such as "*Les fusées d'enfants*" and "*Qui ne tuent pas,*" regarding the new weapon. A similar result attended the use of the Murata rifle by the Japanese during the Chinese-Japanese war. "The Chinese, wounded by two or more small-bore bullets, had no difficulty in getting away, while the real execution was done by the heavier bullets, which were still being used by the bulk of the Japanese troops."

General Howe (*loc. cit.*, ANNALS OF SURGERY, Vol. xxv, p. 48), who commanded the leading column in the Chitral campaign, is

quoted by the *Washington Post* as saying, "Often prisoners were brought in with two or three bullet-holes through them that seemed to cause the wounded men but little inconvenience, for they had been marched six or seven miles before they reached our bivouac. These prisoners accounted for the extraordinary absence of the dead enemy on the field by saying that unless a man was shot in the head or bowels he did not die, and nothing but a wound in the joints of the lower extremities disabled him. I am clearly of the opinion that for fighting savages the old forty-five (45) calibre arm should be used. The Chitrals had a forty-five (45) calibre rifle, and they disabled or killed a man whenever they hit."

From this it is evident that the practical results have not been sufficient to enable us as yet to reach a uniform conclusion as to the precise merits and demerits of the new projectile. That it has advantages it is useless to repeat; that there are certain shortcomings the practical results have already demonstrated. At present, the interesting feature of the new projectile is to determine the conditions under which the greatest advantages are to be gained. The circumstances under which it behaves as a humane invention and when it does just the reverse.

In a contribution to the *Revista de Ciencias Medicas*, of Havana (*loc. cit.*, *London Lancet*, June 6, 1896), Dr. Enrique Pedrassa, a Spanish military surgeon, remarks, "that the benign results he had expected to see do occur, but only when the enemy is 150 yards or more distant. When the patient is shot at from ten to seventy yards, the destruction of the tissues is very great, and it is this that has given rise to the suspicion that explosive bullets were being used, especially as the orifices of outlet and entrance are so small that they can hardly be seen. If the fighting should never occur at less than 200 yards, the Mauser would be the most humane weapon."

To appreciate the small-bore projectile, it is well to consider some of the conditions governing the behavior of the projectiles in general.

Whenever a projectile strikes a body we are at once confronted by two opposing forces, the one in the main an onward force inherent in the projectile, and the other a resistant

force inherent in the object. Each of these forces is capable of wide variation under modifying conditions. On the side of the projectile the effect is dependent upon the character of the weapon, the explosive, and the projectile itself.

The rifling of the bore of the modern weapon has given to the projectile a rotatory movement in addition to its purely penetrative one. This rotatory motion imparts accuracy to its flight and an independent lateral action on meeting an object. This has been thoroughly brought out by the experiments of the German War Office and others, that even after the penetrative action of the projectile ceases, the rotatory action may continue.

The substitution of practically smokeless for the ordinary powder has increased the missile's energy and velocity, not to speak of the other advantages which the smokeless explosive has over the common gunpowder.

Hand in hand with the rifling and other improvements in the weapon, and the improvement in the propulsive agent, came the change in the projectile. For a soft, wide, and heavy projectile we substitute a hard (non-deforming), narrow (diminished frontage), and lighter, the latter enabling the combatant to carry a greater number. The change from a soft to a hard projectile overcame its tendency towards alteration in its form, and upon the preservation of its form largely depended its degree of penetration, as well as the character of the wound it was capable of creating. The humane nature, whenever the wound partakes of this character, is due more to the non-deforming character than any other element. For this reason the English introduced the soft-nose or "Dum Dum" bullets in their colonial wars. These projectiles produced gruesome wounds, and exposed England to the criticism from other powers that the use of this bullet was contrary to the convention made with European powers in 1868. Lately, the "Dum Dum" bullet has been replaced by another projectile, known as the hollow-tip bullet. The following is extracted from an abstract of an article by Professor Bruns, *Beiträge zur klinischen Chirurgie*, Band xxiii, Heft 1, in ANNALS OF SURGERY, Vol. xxix, page 651:

"This bullet is the same diameter, 303, the same length, one and one-fifth inch, and the same weight, 215 grains, as the Lee-Metford bullet. The case is of nickel, the base only being filled with lead. The conical end is left empty, and when it strikes the enemy bursts open backward and lodges in the body, penetration being lessened and shock increased. The new bullet is spoken of as the man-killing instead of the man-penetrating bullet. It is propelled with cordite, and has as much energy as the Martini-Henry bullet of 410 grains with the best gunpowder; whilst it is half the weight, it is more easily deformed than the ordinary jacketed projectile, but not as easily deformed as the 'Dum Dum.' At short range, all injuries are more severe than the jacketed. Wounds of hollow viscera containing fluid are of tremendous severity, as the missile explodes with great force. In penetrating, it compares favorably with the ordinary; so long as no alteration in its shape is produced the greater the resistance of the target the more unfavorable the comparison. The following examples are instructive:

"Distance twenty-five metres, dry deal block, 'full mantle,' no change, 100-110 centimetres penetration; hollow tip, slightly altered, eighty-four centimetres penetration; lead tip, markedly altered, twenty centimetres penetration. Same distance, dry beachwood, 'full mantle,' no change, fifty-four centimetres penetration; hollow tip, markedly altered, fourteen centimetres penetration; lead tip, markedly altered, twelve centimetres penetration."

Reduction in calibre means a reduction in the resistance offered, not alone by the object but also by the atmosphere. The accuracy of the projectile's flight depends largely upon its weight, for the lighter the missile the more rapid must be its rotation to secure accuracy, and the lighter the missile the easier will its rotation become irregular.

According to Köhler, a five-millimetre projectile must rotate about 7000 times per second to secure its accuracy. We may sum up that energy, velocity, weight, frontage, and the likelihood of deformation are the factors on the side of the projectile, which determine its effect upon striking an object.

In speaking of the ballistic qualities of the new projectile, different writers have compared its action with that of a spinning-top. When the top begins to spin, it is a rotatory motion accompanied by more or less lateral wobble, soon the lateral

wobble disappears, and we have a pure rotatory motion, towards the close it again assumes the lateral wobble, which increases with the decrease of the rotatory motion until the spinning comes to a close.

Largely upon this behavior occurred the division of the new projectile's flight into three zones. The first or explosive zone, owing to explosive appearance, which wounds created in this zone commonly present; the second or penetrative zone, owing to a purely penetrative nature, which represents the behavior in this portion of the missile's flight, and the third or contusing zone. By explosive effect we mean the destruction created outside of the projectile's passage.

In the first zone, the projectile's flight represents a high degree of energy, velocity, rotation, and lateral sway.

In the second zone, a gradually diminishing energy, velocity, and rotation, with very slight lateral sway, which makes its effect practically a purely penetrative one.

In the last, the energy, velocity, and rotation are diminished, and the lateral sway again occurring and increasing with the decreasing penetrative action.

The German War Office does not favor such a classification, owing to the difficulty of determining a division in the projectile's flight.

The elements inherent in the object or target which determine the effect of the projectile are various, prominent among which are two forces, elasticity and cohesion. To these may be added the physical properties peculiar to the body, such as specific gravity, homogeneity, etc.

Before a body will break or tear it will bend and stretch in proportion to the amount of elasticity it possesses. The assertion of the elastic force is largely dependent upon the velocity of the projectile, for the greater the velocity the more the object behaves as an inelastic body, and the less favorable is the condition for the exhibition of the elastic force. The influence of cohesion applies as strongly to the projectile as it does to the object, for if the cohesive force in the target is greater than that of the projectile, there occurs a destruction of the projectile rather than that of the target.

Köhler divides the resistance which a body offers into active and passive. The active is that which is appreciated in a gross way, and the passive that which is considered in a molecular sense. Both, however, are molecular in their character, for to overcome the resistance is to overcome the molecular inertia or destroy its cohesive force. This has been shown in a classical way by Kocher, by firing into a tin box filled with marbles and observing the impressions that the exterior of the box presented as the result of the internal impact (*loc. cit.*, Köhler, "Die Moderne Kriegswaffen," p. 152).

Specific gravity is another factor, modifying the momentum of the projectile as much as it modifies the resistance of the target. The heavier the projectile, the greater the momentum; the heavier the target, the greater the resistance, other things being equal.

Homogeneity modifies the effect, in that the more homogeneous the body is, the more perfectly is force transmitted. Here, again, experimenters have made the can serve a useful purpose. When filled with water and fired into, a perfect explosive action is obtained. The experiments of Reger, "Neue Beobachtungen über Gewehrerschusswunden" (*Deutsche Militär Aerztliche Zeitschrift*, 1887, Heft 4, Taf. i-iv), have demonstrated the influence which distance plays upon the development of explosive action. Cans filled with fluid and fired upon at a short range showed perfect explosive action, whereas, when fired upon at a long range were simply attended with an opening of entrance and exit. Furthermore, he recognized the rôle which the deformation of the missile played in the production of the wound, and suggested in an address, "Die Aufforderungen der Humanität," *loc. cit.*, Lühe, "Vorlesungen über Kriegschirurgie," the substitution of hard for soft missiles; a suggestion which later met with adoption, but for purely technical reasons. Since the amount of moisture which a tissue possesses determines the explosive effect as much as the distance, and owing to the difficulty of determining the limit of the respective zones, the German War Office proposed, in lieu of the division into zones, a classification into "Nahschüsse," short range, and "Fernschüsse," or long range.

The explanation of the explosive effect that commonly attends wounds of viscera filled with or rich in fluid lack a noticeable degree of unanimity. According to Busch, it is due to hydraulic pressure, and is encountered in wounds of the skull and shafts of long bones. Von Beck, Vogel, and the German commission consider it to be due to a hydrodynamic rather than a hydraulic force. Sir William McCormac (*London Lancet*, August 3, 1895) believes "that the explosive effect is due to the rapid arrest of the flight of the bullet on piercing fluid matter and its motion being transferred to the parts immediately surrounding it, and these again transmitting it to parts further removed, somewhat as wave-circles are produced by a stone dropped into smooth water. He objects to the hydraulic idea, because the pressure is not equally exerted in all directions, but chiefly in the direction of the flight of the projectile, and it occurs in almost an equal degree in both closed or entirely open vessels filled with fluid or jelly." According to Köhler, page 174, it is due more to the projectile acting as a wedge which, moving with a high degree of velocity, produces an impression that is suddenly and perfectly transmitted in every direction throughout the entire mass. The same author points out that the velocity makes it impossible for the water to separate with the necessary rapidity, and being incompressible and homogeneous, it not only behaves as a solid body, but in the most sudden and perfect manner transmits force in all directions. In considering this, two factors must be borne in mind; the degree of increase in volume and the rapidity of this increase. Water has indeed an extraordinary influence on the projectile's flight, as Sir William McCormac has pointed out, that a projectile capable of travelling 4000 yards in air will be arrested after travelling three or four yards in water. Summing up, we may repeat the epigrammatic expression of Köhler,—diminished velocity and increased mass, increased velocity and diminished mass, destroy in a like manner the opposing object. Movement and mass, on the one hand, and time and space, on the other, are the elementary factors in the behavior of the projectile and target.

Coming more directly to the effect of the projectile on the

human body, we again refer to the division of its flight into zones, this at least being a convenient way of analyzing the character of wounds it is capable of creating.

The first zone comprises the first 500 yards of the projectile's flight, and has been termed, by Habert, the explosive zone, and by Bruns, the zone of greatest energy. The second zone comprises a distance of from 500 to 1200 yards, and the third zone, a distance of from 1000 or 1200 to 2000 yards, *loc cit.*, Dr. Eschweiler, "Die Schussverletzungen durch das kleinkalibrige Gewehr."

Wounds of bones that have been inflicted in the first zone are characterized by extensive crushing and splintering, while in the second zone we have a clearly perforated wound, such as might be made by a punch, and that has by many been referred to as typical of the new projectile. In the third zone, we have an extensive injury to the bone different from that created in the second zone, but resembling again somewhat that created in the first zone. These conclusions have received the indorsement of the French experimenters.

The prognosis, where the bone is splintered, depends largely upon the degree of comminution. Where the fragments are large, with the periosteum intact, the fragments may yet receive sufficient nutrition to preserve their integrity, and determine a successful reunion. Where there is great comminution with a separation from the periosteum, they are not only lost, but play the harmful rôle of foreign bodies. The degree of splintering and comminution is not alone dependent upon the distance, but also upon the portion of the bone that is involved. A wound involving the shaft is attended with a fracture into larger fragments, and less real comminution than that which attends a wound of the extremities of the bone. These large fragments, with their intact periosteum, give to these wounds a more favorable nature.

Reviewing the experiments of Bruns, Sir William McCormac (*loc. cit.*, *London Lancet*, August 3, 1895) notes that Bruns found intense explosive effects up to 400 yards. These attained their maximum in the skull, and upon semifluid organs, like liver, spleen, a full stomach, or intestine. In the elastic lung

tissue, however, or upon empty viscera no effects of this kind followed. When the bone was implicated, the track as far as the bone was usually no larger than the ball, but the tissues beyond were always intensively damaged, and the exit wound was very large. At a distance of 400 to 800 yards explosive effects were only witnessed in the skull. Soft parts were traversed by a narrow channel no larger than the bullet itself, with but little damage to the surrounding tissue. At the range of 800 to 1200 yards explosive effects were only occasionally produced in the skull, and in a much diminished degree. The 900 experiments made by the German War Office do not harmonize with Bruns's classification of injuries into groups according to range. As the range increases there is a gradual diminution in the velocity and energy of the projectile, and a corresponding diminution was observed in the extent of the injury. The bullet, in nearly every case, was found to go straight through the part struck, and the old-fashioned contour shot was never met with. The human body is traversed with ease at 2000 yards, and the skull, thorax, and abdomen will suffer alike. At less than half this distance the old bullet has lost most of its momentum, and becomes flattened out or impacted when it strikes a bone without penetrating deeply. In wounds of the abdomen, the liver showed the largest amount of damage, and, in some cases of suicide, large portions of it were reduced to pulp. Up to 1200 yards the entrance wound was usually large and stellate, and the exit track funnel-shaped, with lateral rents extending from it.

Gunshot fractures of the long bones vary according to which bone or part of the bone is struck. The effect upon the spongy extremities and upon the compact tissue is very different. From 100 to 200 yards the shaft of the femur is broken up into small pieces, for an extent of from three to five inches, and the humerus from two to six inches. At the entrance wound in the bone the fragments remain in part attached to the soft parts, but at the wound of exit they are completely filled with bone *débris* and detached fragments of bone, the muscles and tendons are torn, and the exit wound in the soft parts is large and ragged.

In the spongy bones and spongy extremities of the long bones the crushing and fissuring at short range are also great, but the fissures are often concealed by untorn periosteum, and there is less damage to the soft parts at the wound of exit. At the range of 600 yards there are occasionally key-hole shots, with radiating fissures in the spongy tissue, and at 800 yards the key-hole channels become frequent, but even up to 1600 yards the compact tissue is extensively fractured. At 1200 yards the fragments of bone, as a rule, are no longer driven into the soft parts beyond; but this happens occasionally even up to 2000 yards.

According to McCormac, the conclusion to be drawn from the German experiments is "that the damage to the shaft of a long bone is very extensive for all ranges up to 2000 yards, the main difference being that at short ranges, of 200 to 300 yards, for example, the fragments are more numerous, smaller, and more stripped of periosteum, while the converse obtains at longer ranges. Cases where a large artery is wounded generally die before help arrives; and it is interesting to know that, in the late war in China, the Japanese surgeons had such perfect arrangements that in two cases, one a wound of the brachial and the other of the femoral artery, the vessels were tied and the patients saved in the fighting line itself."

CONCLUSIONS.

(1) All advanced nations have *practically* the same character of rifle and projectile, and the remarks applying to one apply *practically* with equal force to all.

(2) That the modern small-bore projectile is capable of producing wounds of both a humane and gruesome nature.

(3) The nature of the wound produced by the small-bore projectile is either dependent upon the intervening distance or the character of the structure wounded, or both.

(4) The precise manner in which the explosive action is developed in structures filled with or rich in fluid is still *sub judice*.

(5) The weight of the evidence and the majority of authors favor the hydrodynamic rather than the hydraulic theory.

(6) The new projectile is propelled with greater energy, velocity, and accuracy; it is lighter, has a smaller frontage, and is less liable to deformation on striking an object.

(7) The new projectile has less "disabling capacity," and on the whole produces wounds of a more humane character than the old leaden bullets.

(8) By explosive action is meant the damage created in structures outside of the projectile's passage.

(9) The explosive action depends upon the deformation of the projectile, the range, and the character of the tissue.

(10) The shorter the range within the first 400 to 600 yards of the projectile's flight the more pronounced the explosive action.

(11) At 800 or 1000 yards explosive action is occasionally met with, and then only in the skull or in other parts of the body filled with or rich in moisture.

(12) At a distance of 800 to 1200 yards the new projectile, as a rule, creates wounds with small orifices of entrance and exit, and little or no explosive action.

(13) That the rotatory action of the projectile may continue after its penetrative movement ceases, and that the character of the wound is partially dependent upon this rotation.

MAMMOTH OVARIAN TUMORS.

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In searching the literature of this subject, only growths weighing 100 pounds or more have been considered as mammoth tumors. Reports of twenty-three such tumors have been found. Below are appended brief summaries of these cases chronologically arranged.

(1) Ovarian Tumor Weighing 106 Pounds. Great Elongation of the Cervix Uteri and Vagina. By D. George B. Gibb. (*Transactions of the Pathological Society of London*, 1855-56, Vol. vii, p. 273.)

This tumor weighed 106 pounds, and was removed *post mortem*.

(2) A Case of Enormous Polycystic Ovarian Tumor. By Louis A. Rodenstein, M.D. (*American Journal of Obstetrics*, 1879, Vol. xii, p. 303.)

The tumor weighed 146 pounds, and was removed *post mortem*.

(3) An Enormous Ovarian Tumor. By G. D. Neal, M.D. (*Louisville Medical News*, 1883, Vol. xvi, p. 305.)

This tumor was removed *post mortem*, at which time it contained fluid weighing 119 pounds. She had been tapped for three years previous to her death, in all six times, 487½ pounds of fluid having been removed in this way.

(4) Dr. Goodell (*Philadelphia Medical News*, 1883) reports an ovarian cyst removed by operation, weight 112 pounds. Omental and parietal adhesions. Recovery.

(5) An Ovarian Cyst Weighing 116 Pounds Successfully Removed. By Howard A. Kelly, M.D. (*American Journal of Obstetrics*, 1885, Vol. xviii, p. 795.)

In this report Dr. Kelly mentions the following two cases:

(6) Spencer Wells removed a tumor, weighing 125 pounds, from a woman in June, 1873. The patient recovered.

(7) Dr. Keith (statement by Emmet) removed an ovarian tumor weighing 120 pounds. Recovery.

(8) Dr. H. A. Kelly (*Maryland Medical Journal*, 1886, Vol. xv, p. 49) reports an ovarian tumor, weighing 100 pounds, successfully removed by operation.

(9) Colossal Cyst of the Ovary. By M. Buffet. (*Bulletin de la Société de Médecine de Rouen*, 1887-88, 1. 2, S. 117.)

Eighty litres of fluid were withdrawn to relieve impending asphyxiation. Death occurred in forty-eight hours. The autopsy showed a unilocular cyst of the left ovary with subperitoneal fibroma of the uterus, weighing thirty-six pounds. The cyst contained ten litres of fluid; this, added to the eighty litres removed during life, gives a total of 180 pounds for the ovarian tumor and 216 pounds as the combined weight of the ovarian and uterine tumors.

(10) Large Ovarian Tumor. By W. L. Estes, M.D. (*Transactions of the Lehigh Valley Medical Association*, 1887, p. 20.)

This was a polycystic, thick-walled tumor, in which introcystic papillary degeneration had begun. This tumor mass and fluid was calculated to weigh over 125 pounds. On account of adhesions the operation was very difficult, lasting four and a quarter hours, and requiring about 200 ligatures, in addition to the free use of the cautery. The woman made an uninterrupted recovery.

(11) Ovariectomy. By John Homans, M.D. (In his "Three Hundred and Eighty-four Laparotomies for Various Diseases," Boston, 1887, p. 15.)

Case LXXXII, a large ovarian cyst, whose solid and fluid contents (part of which was removed by aspiration a few days before operation) weighed 105 pounds, was removed by operation. Recovery.

(12) A Case of Unusually Large Ovarian Tumor. By Charles K. Briddon, M.D. (*New York Medical Journal*, 1890, Vol. vi, p. 141.)

A multilocular cyst, weighing 149 pounds, was removed by operation. Death followed about eight hours afterwards.

(13) An Enormous Ovarian Cyst. By Dr. Cullingworth. (*Lancet*, London, 1891, 1, 999.)

Preparatory to operation, and in order to diminish shock, aspiration was practised the day before operation. The fluid was allowed to escape for seven hours, amounting to seventy-four pints of thick grumous, chocolate-colored fluid, containing much blood. Operation was undertaken the next day under ether. The tumor was adherent over the entire anterior surface of the abdominal wall. At the end of one-half hour the patient was seriously collapsed, and died before the abdominal wound had been closed. The total weight of the tumor and its contents, including that of the fluid removed on the day before operation, was 154½ pounds.

(14) Mammoth Unilocular Ovarian Cyst. By Dr. A. M. Cartledge. (*American Practitioner and News*, 1891.)

The patient was thirty years old; first noticed enlargement of abdomen at the age of sixteen. Circumference at navel sixty-six and one-half inches. Removal by laparotomy. No adhesions. Recovery. The tumor weighed 111½ pounds.

(15) The Treatment of Large Ovarian Cysts: Report of Case. By Edward P. Davis, M.D. (*Annals of Gynecology and Pædiatry*, Philadelphia, 1893, Vol. vi, p. 539.)

A multilocular cyst, weighing 160 pounds, was removed by operation. The pedicle was so small as to scarcely require ligation. No adhesions calling for ligation were present, and hæmorrhage was inconsiderable. The patient partially collapsed during the operation, from which, however, she reacted, becoming conscious. Six hours later, without warning, she died in sudden syncope.

(16) An Ovarian Tumor Weighing 111 Pounds. Removed from a Child of Fifteen, whose Weight was Sixty eight Pounds. By Dr. W. W. Keen. (*The College and Clinical Record*, Philadelphia, 1893, Vol. xiv, p. 134.)

A multilocular cyst of the right ovary was removed by operation. There were moderate adhesions to the belly wall and omentum, but the viscera were entirely free. Uninterrupted recovery.

This case was especially remarkable, the age of the child being only fifteen years, and the weight of the tumor exceeding the child's weight by forty-two pounds.

(17) Enormous Cyst of the Ovary in a Young Girl of Seventeen Years. Ovariectomy. Cure. By H. Dayot, Jr., M.D. (*Archives Provinciales de Chirurgie*, Paris, 1893, Vol. ii, p. 559.)

An ovarian cyst was removed by operation, October 9, 1891, from a girl seventeen years old. On entering the abdominal cavity about fifteen litres of ascitic fluid escaped. There were adhesions to the abdominal wall and omentum, but no other visceral adhesions. The operation had to be suspended three times on account of alarming syncope. The operation was completed in two and one-half hours, and the patient put to bed in a semisyncopal condition. For three weeks her condition was quite serious, owing to gastric and intestinal complications. She made, however, a complete recovery.

The total weight of the cyst and the fluid removed was 198 pounds; this included the fifteen litres of ascitic fluid, something over thirty pounds. The girl who carried this tumor weighed not quite sixty-six pounds.

(18) Cyst of Ovary. Operation. Recovery. By H. Maritan (de Marseille). (*Gazette Médicale de Paris*, 1893, Vol. lxiv, 2, S. 22.)

This ovarian cyst was removed by operation. There were numerous adhesions, and alarming collapse followed the operation, but recovery was complete. Her weight before operation was 117 kilogrammes (254 $\frac{1}{10}$ pounds); after operation she weighed forty-two kilogrammes, which gives the total weight of the tumor mass removed as seventy-five kilogrammes (165 pounds). (This case is referred to by Dr. Harris in his article on "Ovariectomy in Shanghai, China," which follows. There seems to be a discrepancy in the weight of the tumor as reported by him; he says the woman weighed 337 pounds and the tumor 200 pounds 14 ounces.)

(19) Ovariectomy in Shanghai, China. Tumor, 182 pounds. By Robert P. Harris, M.D. (*Transactions of the College of Physicians*, Philadelphia, 1895, Vol. xvii, p. 71.)

This case was operated upon by Dr. Elizabeth Reifsaydor, and was reported in full in the *American Journal of Obstetrics*, 1895, Vol. xxi, p. 512. The tumor was a cystoma of the left ovary, in a small woman weighing ordinarily ninety pounds; the total weight of the tumor and its contents was estimated at 182½ pounds. She made a good recovery.

(20) Enormous Ovarian Tumor, 202 pounds in weight. Death. Reported by A. M. Garcelon, M.D. (*American Gynecological and Obstetric Journal*, N. Y., 1895, Vol. vi, p. 448.)

This tumor was first aspirated by trocar, 132 pounds of fluid being withdrawn. Five days later the sac with contents, weighing seventy pounds, was removed by abdominal incision. Both ovaries were affected and removed. The cysts were simple and non-adherent. The total weight removed was 202 pounds. The woman died two days after operation.

(21) A very Large Dermoid Ovarian Tumor Successfully Removed. By Skene Keith, M.B., F.R.C.S. (*British Gynecological Journal*, 1895-96, Vol. xi, p. 466.)

This was a dermoid ovarian tumor, containing, however, seventy-five pounds weight of fluid, which was removed by tapping. Some days after laparotomy was performed and the tumor removed. There were no adhesions except in the pelvis. The total weight of the tumor and contents was more than 100 pounds. Recovery.

(22) The Successful Removal of a 125-pound Ovarian Tumor. By J. G. Lynds, M.D. (*Transactions Michigan State Medical Society*, 1898, Vol. xxii, p. 147.)

A multilocular cyst, weighing 125 pounds, was removed by operation. The cyst was adherent to the abdominal wall over its entire portion, as well as to the diaphragm, stomach, and omentum. Recovery.

(23) An Enormous Ovarian Cystoma. By D. Tod Gilliam, M.D. (*Medical Record*, August 5, 1899.)

This ovarian cyst, weighing a little more than 176 pounds, was removed by operation, the patient making a complete recovery. There were extensive adhesions to the abdominal wall, which were separated with great difficulty.

To the twenty-three it is desired to add the case of Dr. A. M. Cartledge and myself, operated on May 13, 1897. The tumor sac, with a brief report, was unofficially (not being on the programme) exhibited by him at the meeting of the American Medical Association in Philadelphia in June, 1897, and will be found mentioned in the *Association Journal* of December 18, 1897. It is now reported in full for the first time, in conjunction with, and by the courtesy of, Dr. Cartledge. The following gentlemen were present at this operation: Drs. J. A. Crosby, Allen Crosby, Tom Buckner, T. N. Willis, W. F. Beard, Frank Beard, T. E. Bland, G. Lawrence, C. P. Harwood, and R. D. Pratt, all of Shelbyville, Kentucky.

The patient was a woman of thirty-seven years, the mother of one child. She was five feet four inches tall and of large frame. The tumor had been recognizable for many years; eight years before, the woman had gone to Louisville for operation, but her courage failed at the last moment, and she had returned home untouched by the surgeon's knife. The tumor continued to increase in size, and pressure-effects became so marked that for the last year and a half she had been able to rest only in the sitting posture. At the time of operation the condition was extreme; respiration was becoming wellnigh impossible, and strength had been much reduced. The enormous abdomen hung down to the knees. The circumference at the navel was seventy-nine inches, and the distance from the ensiform cartilage to the pubis was forty-nine inches.

The patient's condition made it impossible to think of moving her, so operation was undertaken in a small house in the country, eight miles from Shelbyville, Ky. Unfortunately our anæsthetist had missed

the train, and the gentlemen present, as spectators, were unwilling to essay the anæsthetic, as they did not believe it probable that the patient would survive the operation. I was, therefore, deployed to give the anæsthetic while Dr. Cartledge attacked the tumor handicapped by the loss of an accustomed and trained assistant. The woman and tumor combined weighed nearly 400 pounds, so first we had to nail the rickety table to the floor and brace it with pickets knocked off the garden fence. Before the administration of chloroform was begun a prelimi-



FIG. 1.—Mammoth ovarian cyst, weighing 245 pounds.

nary tapping was done, with the patient sitting upright on the table edge. Twenty-four gallons of fluid were then withdrawn. The chloroform was given with the patient in a semireclining position. After exposing the sac, ten gallons more of fluid were withdrawn. The operation consumed two hours, and was most difficult because of the extensive adhesions. The parietal wall was anteriorly stuck fast to the sac over perhaps half of its extent, and there were extensive adhesions to the intestines, and also adhesions in the loins and pelvis. The adhesions required many ligatures, but were finally all separated, the

pedicle was tied off and the sac removed. The cyst was unilocular. A large amount of gauze was packed in over the raw surfaces, dressings were applied, and finally a large pillow was placed beneath the binder over the abdomen, replacing in some measure the pressure of the tumor so suddenly removed. The patient left the table with a pulse of 114. She progressed well until the fifth day, when her temperature was normal and pulse 108. At this time symptoms of intes-



FIG. 2.—Appearance of abdomen three days after operation.

tinal obstruction began to manifest themselves, and the patient finally succumbed on the morning of the seventh day. The reproduced photographs give a very fair idea of the appearance just before and three days after operation. The weight of the tumor sac and contents, weighed by Drs. Willis, Crosby, and Beard, was 245 pounds; thus it will be seen that this cyst weighed forty-three pounds more than any recorded in history.

In considering the above twenty-four cases it is observed that, of the fifteen cases operated on in which recovery took place, the average tumor weight was 129 pounds; while of the six in which operation was followed by death, the average weight was 181 pounds. Case IX should perhaps be excluded from these six, as in it only aspiration was done for the purpose of relieving impending asphyxiation, death following in forty-eight hours; but as this tumor weighed 180 pounds, the average weight will not be changed.

In nine of these fifteen cases which recovered adhesions were noted as present, either slight or extensive; while in the five fatal cases adhesions were very extensive and troublesome in two cases, were very slight in one case, and were entirely absent in one; in the remaining fatal case (XII, Dr. Briddon's) the transcript makes no statement about adhesions. Of the five deaths, three occurred either on the table or within a few hours as a result of syncope (shock). One (XIV) occurred in two days, the exact condition not being stated; and one in seven days (XXIV) as a result of intestinal obstruction.

In two of the fifteen successful cases, preliminary tapping was done a few days before operation, seventy-five pounds of fluid being so withdrawn in one case, the amount not stated in the other. Of the five fatal cases two were tapped beforehand, seventy-five pints being withdrawn in one case and one hundred and thirty-two pounds in the other.

These considerations are interesting, but are unavailing in so far as they might be expected to throw any light on the most important question in connection with this subject,—viz., the wisest and safest method of dealing with mammoth tumors. It is to be hoped and believed that, for the future, fewer and fewer of these tumors will succeed in eluding the surgeon's knife at a time when they can be very simply and safely dealt with.

Manifestly but three methods of dealing with these tumors present themselves. (1) Immediate extirpation; (2) preliminary tapping, followed in a short time by extirpation; (3) tapping repeated as often as necessary to relieve uncomfortable distention.

Most surgeons will doubtless remain sufficiently radical in their feelings to prefer the risk of immediate death at their hands, combined with the possibility of complete cure, rather than the martyrdom to a colossal cyst which would require frequent tapplings. Nevertheless, it is possible for a woman to reach a good and ripe old age under these circumstances. Dr. Ap. M. Vance, of Louisville, has reported a most remarkable case of this kind. The woman began to be tapped at the age of thirty-four years, and this was repeated at intervals until death overtook her at the age of eighty. In all, she was tapped 179 times. While under Dr. Vance's observation, an average tapping measured twelve gallons. It was always a very heavy, mucilaginous fluid, and would have averaged at least ten pounds in weight to the gallon. So at each tapping about 120 pounds of fluid were withdrawn. Assuming that the amount all along had been about the same, we find that this woman, during forty-six years of her life, produced and was relieved of the astounding quantity of 21,480 pounds of this fluid. On the other hand, many women soon succumb to such a fearful drain, as illustrated by Case III, the woman dying in three years after 487 pounds of fluid had been withdrawn.

While these cases reported do not distinctly show it, it must be true that extensive adhesions compromise severely the probability of recovery. Unfortunately, the extent of adhesions cannot be determined beforehand. And even if such determination could be made, the choice of method would still remain an open one for the individual judgment. The extent of adhesions can only be determined after the operation has been begun, as in Dr. Cartledge's case (XXIV). In this case, after the extent of adhesions had been determined, the operation had so far progressed that desistance would necessarily have been fatal, and so it had to be pushed to a radical conclusion.

Under such circumstances marsupialization, as recommended by Pozzi, Pean, and Spencer Wells, could scarcely be considered. The process which would be essential for the obliteration or casting out of the sac in such mammoth tumors would necessarily terminate fatally.

In so far as any conclusions can be drawn from a study of these twenty-four cases, the following are submitted :

(1) The fatality from such tumors is directly proportioned to the size of the tumor.

(2) Extensive adhesions to the parietes and viscera militate against successful operations, but are second in importance to the size of the tumor.

(3) Preliminary aspiration, followed by extirpation in a few days, is apparently no safer than immediate operation.

(4) Marsupialization is contraindicated in tumors of mammoth proportions.

(5) Successive tappings are sometimes tolerated over a long period of years, but lead ordinarily to exhaustion and death in a comparatively short time,—a few years.

(6) When death occurs after operation, it is most apt to be immediate, within a few hours, as the result of shock. If this first danger is passed safely, the fatal issue is apt to be the result of obstruction of the bowel, especially in those cases where extensive adhesions are present.

* * * * *

November 2.—Since writing the above, a twenty-fifth case has been communicated to the writer by Dr. A. H. Cordier, of Kansas City, Missouri. The patient was a mulatto woman, very much emaciated, and with an enormous tumor, weighing 165 pounds. Operation and complete extirpation were followed by death.

ON VESICO-URETHRO-VAGINAL FISTULA.

BY J. SHELTON HORSLEY, M.D.,

OF EL PASO, TEXAS.

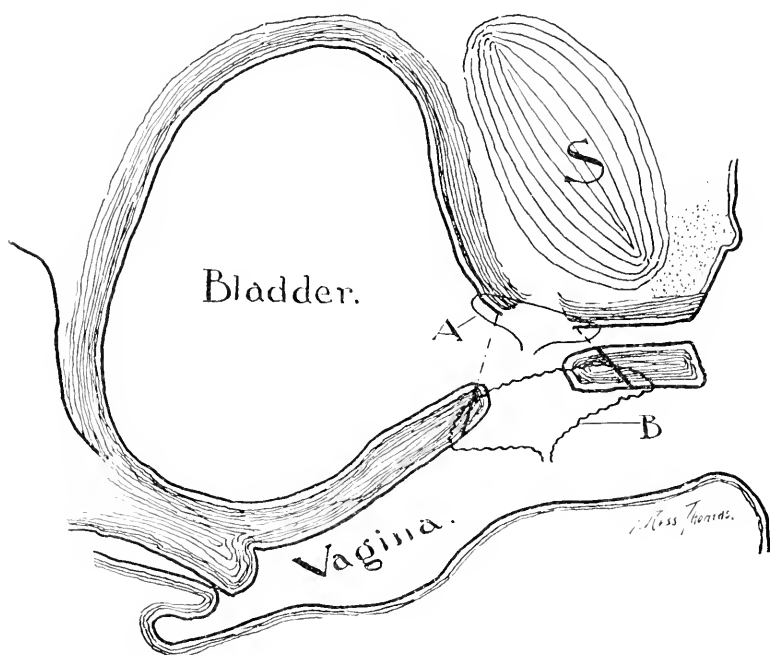
CASES of vesico-vaginal fistulæ, in these days of improved obstetrical procedures, are comparatively rare, but still occur with sufficient frequency to make their successful treatment a matter of interest to surgeons. Since Marion Sims's brilliant work, the cure of this affection has not attracted very much attention, both on account of the modern use of forceps in obstetrics dispensing with prolonged labors, and because the technique he originated left little to be desired in the ordinary type of cases. However, in spite of these facts, one occasionally sees, even in our large cities, women who have undergone numerous operations and are still uncured. It is probably the rule that all vesico-vaginal fistulæ, except the smallest and simplest ones, require a series of operations before the case is complete.

The case, whose report follows, presented a very unusual lesion,—vesico-urethro-vaginal fistula. The operation done is, so far as I can learn, original.

CASE.—Mrs. F. C., Mexican, primipara, aged twenty-two, had had good health previously. She was confined January, 1899, and was attended by an ignorant midwife, who permitted the labor to continue about forty-eight hours before the child was born. A few days after confinement the urine passed from the vagina, and in a short while all of it came in this way. Such had been her condition for several weeks, when Dr. J. A. Samaniego was called to see the case. Dr. Samaniego had Dr. F. W. Gallagher in consultation, and these two gentlemen kindly referred the case to me for operation. On examination, the urethra and bladder were found completely disconnected, the urethra being a functionless tube. The opening into the bladder was about a half-inch in diameter, the distance between the lower part of this opening and the lower part of the urethra one

and a half inches, and between the upper part of the vesical opening and the upper part of the urethra a half-inch. In other words, there had sloughed out a triangular mass of tissue, including part of the neck of the bladder and the whole thickness of the urethra, with its base towards the vagina and apex, behind the symphysis pubis. Cystocele was present.

Operation performed April 25, 1899, under chloroform anæsthesia. Patient was placed in the Sims's position. I had at first expected to dissect the bladder from the uterus and possibly from the



vagina, but an ample cystocele permitted approximation of the parts without too much tension. I first denuded the tissues around the opening in the bladder down to the vesical mucous membrane; then, so as to make the diameter of the opening in the urethra equal to that in the bladder, and at the same time to get rid of some irregular scar tissue, the urethra was cut obliquely (as shown in the figure). Two silk sutures were inserted, going through the mucous membrane and muscular coat of the bladder and the upper part of the urethra (*A* in the cut). These approximated the upper part of

the vesical opening and the corresponding portion of the urethra. Then four sutures of fine silkworm gut coapted the lower portion of the vesical and urethral openings (*B*). These did not penetrate the mucous membrane. On account of the existing cystocele the bladder could be readily pulled forward. A catheter was then inserted through the urethra and another through a small incision made in the base of the bladder. This provided for ample drainage. The catheter in the base of the bladder accidentally came out four days after operation, and was not reinserted. The one in the urethra was removed a week later. The silkworm-gut sutures were removed twelve days after operation. The silk sutures were, of course, left. The incision in the base of the bladder closed after the catheter came out and was not reopened. The middle portion of the sutured wound healed nicely, but two fistulæ remained, one at each end of the wound. On May 19, 1899, a second operation was performed, and an attempt made to close them, with only a partially successful result. Both fistulæ were diminished in size by this operation, but neither was closed. An operation under cocaine anæsthesia, two weeks later, obliterated the smaller fistula. Patient left the hospital on June 9, 1899, still leaking some. The smallness of the vagina, the presence of some remaining cystocele, the location of the lesion just behind the pubic symphysis, and the adjacent scar tissue made this last fistula exceedingly difficult to operate upon. The chances of success were also decreased by the impossibility of keeping the patient quiet and the disregard of my directions by both her and her husband. She was operated on five times at my office under cocaine anæsthesia before I succeeded in completely closing this fistula, which I did, however, at the last operation, on October 3, 1899.

The bladder is now performing its function properly, and the fistulous openings are firmly closed. A portion of the sphincter vesicæ was destroyed by the trauma from prolonged labor, but enough muscle fibres remained to perform the work of the sphincter in a fairly satisfactory manner.

EDITORIAL ARTICLE.

THE DEVELOPMENT OF THE SURGERY OF THE KIDNEY, WITH SOME OF THE LESSONS CONNECTED THEREWITH.

TWENTY years ago my interest in the question of the possibility of relieving, by operative measures, certain affections of the kidneys was awakened by a post-mortem specimen of calculous kidney which came into my possession. Attached to the case was a long history of pain, exhaustive suppuration, and lumbar fistula. The possibility of interfering surgically in the case had never been seriously entertained, although in the care of the sufferer up to the time of death most eminent medical talent had been employed. This was in the early part of 1879.

The time was one of expectancy and eager hopefulness in the surgical world, but doubts, questionings, and hesitancy to let go traditional ideas and methods were equally prevalent. For twelve years already Lister had been preaching the gospel of carbolic acid, and for eight years had been smothering imaginary ærial germs with his medicated spray. It was the time when the spray machines were most numerous, and when their odoriferous, melano-uriferous clouds enveloped every wound and befogged every dressing. In the temple of Æsculapius the incense of carbolic acid was continually arising, nor as yet had even a faint tinge of the odor of iodoform begun to be mixed with it. Mackintosh protective and the eight layers of carbolated resinous gauze, carbolated catgut, and drainage-tubing, and the 1-40 carbolic solution, these constituted the ordnance through which surgical victories were to be won.

The value of the antiseptic practice had been proven beyond the

possibility of question, but the theory of germ-infection, upon which it was based, had not yet been fully demonstrated. Even so late as December, 1879, in a debate in which many of the leading surgeons of London participated, Mr. Timothy Holmes was able to say that "no convincing proof of the germ-theory, as applied to living tissue and living phenomena, has, as far as I know, yet been offered" (MacCormac, "Antiseptic Surgery," 1880, p. 58). It was not until 1881 that the observations of Ogston, on the relations of micro-organisms to surgical diseases, were published, and not until the publication of the work of Rosenbach, in 1884, and of Passet, in 1885, were the varieties and the natural history of the common micro-organisms of suppuration fully described and their identity established. These had to be preceded by the epoch-making researches of Koch on staining methods and culture media, and it was not until 1881 that his treatise, "*Zur Untersuchung von pathogenen Organismen*," was published.

General surgeons still confined their operative work mostly to excisions of tumors, osteotomies, lithotomies, amputations, and the opening of abscesses. Some of the bolder had timidly begun to experiment upon the radical cure of non-strangulated herniæ. In this very year of 1879 Macewen was about to do his first operation of this kind, and nine years were yet to elapse before Bassini should report, in March, 1888, to the Congress of Italian Surgeons, his first one hundred cases, a report which, in the light of present knowledge, we see to have finally fully established that most beneficent procedure.

Sands was still cautiously opening perityphlitic abscesses, having up to that date incised in five cases, at periods varying from twelve to twenty-one days after the advent of symptoms, for it was not until 1886 that Fitz published his paper on "Perforating Inflammation of the Vermiform Appendix, with Special Reference to its early Diagnosis and Treatment," and not until December, 1889, more than ten years, did McBurney report his first series of operations ("Experience with early Operative Interference in Cases of Disease of the Vermiform Appendix," *New York Medical Journal*, December 21, 1889), and this series included only eight cases. Later in this fruitful year of 1879 Tait was to remove his first pyosalpinx, and to do his first

cholecystotomy. These suggestive dates, which crowd upon the memory of many of us who are still engaged in active professional work, are sufficient to indicate the revolution in surgery which has occurred during the twenty years now ending. Old operations have been made safe, many formerly doubtful procedures have become established in legitimate and common practice, and a host of entirely new surgical attempts have been found feasible and useful. A new surgical literature has been created; in this country the scholarly volumes of Gross, of Agnew, and of Ashhurst have been supplanted by newer writings, books published in the tenth decade of the century, but really inspired and made necessary by the achievements of the ninth decade. Surgical papers, formerly diffused through the pages of journals devoted to general medicine, or in hospital or society reports, have now become so important and numerous that in the English as well as in the German, the French, the Russian, the Italian, and the Spanish tongues, a host of periodicals, both monthly and weekly, are devoted exclusively to them.

Since 1879 the problem of surgical effort has been completely transformed; then it was, "How shall the air be purified?" now it is, "How shall the surgeon cleanse his hands?" In place of the spray-producer has arisen the rubber glove; possibly by the end of another decade both will be companions on the same shelf.

In 1879 the magnificent temples of marble and glass which in 1899 have become common, being recognized as essential to supply surroundings most favorable for securing the asepsis of the period, had not yet been planned, nor was their necessity realized until the more complete understanding of the habitats and the natural history of pathogenic micro-organisms had been arrived at. Perhaps even now the last word has not been said as to the arrangement and construction of these buildings. Is there sufficient of advantage in erecting costly structures to contain amphitheatres that will seat from three to five hundred spectators, when the number of those who can get near enough to the patient to realize, much less to see, the details of what is being done in their arenas can scarcely be one-tenth of that number? Are not these theatres the lingering remnants of the

days when the spectacular element played a large part in the public work of a surgical teacher? When the profession of a whole nation would gather to see a Syme incise a gluteal aneurism, or the benches of a vast amphitheatre would be crowded by physicians and students to see a Wood work against time in the amputation of a limb or the removal of a stone from the bladder. The surgeon of the closing year of the nineteenth century approaches his work in a different spirit. In his daily work he enters regions and undertakes procedures which Syme or Wood never dreamed of, and he does it with a sense of security from disaster, of certainty of a favorable after-progress, of probable accomplishment of the end sought, never enjoyed by the most eminent of his predecessors. To secure this end there is a co-operation of many hands, of assistants and nurses; there is needed long previous training in technical details, and an exact and tender conscience in the observance of those precautions by means of which the infection of the wound is guarded against. The work in its nature each time approaches that of a demonstration in a laboratory of exact science, and it is in the spirit of the scientist, rather than of the man who is to make a display of manual dexterity, that the surgeon of to-day does his work. The operating-room is merely a surgical laboratory; its walls and floors cannot be made too smooth and non-absorbent, too much exactness cannot be exercised in removing from it every dust-catching apparatus or pendant fixture; its furnishings cannot be too simple and easily cleansed; glass and marble, polished brass and steel, vitrified tiles, abundant water clear and sterile, the boiling kettle, and the steam-chamber, these have come to stay, at least until possibly a yet more perfect knowledge of the laws by which living cells are governed may point out simpler methods of protecting such cells from the disturbing influence of external causes during the healing process. Meanwhile is it not to be expected that this spirit of scientific precision and of earnest routine work which now characterizes all surgical effort will more and more eliminate the amphitheatrical element from it, and that in the future, even in institutions devoted to teaching, it will become an unthinkable thing that the number of spectators who shall be permitted to gather about an "*opéré*" shall exceed those who are re-

quired to assist in the work or who may so closely approach the field of work as to be able to see clear enough the steps which are being taken to derive some benefit therefrom? Out of these conditions which I have hinted at, rather than described, which have made the surgeon a laborious scientist rather than a dextrous actor, developed with steady growth RENAL SURGERY, a branch of surgical effort which is surpassed by none other in the degree to which it calls to its aid, for purposes of diagnosis, diverse resources of physical science; in the amount of painstaking, patience, and accuracy demanded throughout every step of its conduct; in the extent to which the observance of the new tenets of surgical technique means success, and their neglect entails disaster; while at the same time, to a notable degree, all its processes lend themselves but little to the spectacular nor have any reward for the distant on-looker. The development of this branch of surgical effort it is my present task to trace.

The incision of a fluctuating tumor pointing in the loin, possibly of kidney origin, or the dilatation of a lumbar fistula and the extraction from its bottom of a calculus, these constituted the sum total of the efforts at surgical intervention upon the kidneys until the advent of the present generation. As to the removal of a kidney, Rayer, in 1840, in his "*Maladies des Reins*" (t. iii, p. 240), summed up the wisdom of the ages in the sentence, "It would be folly to attempt such an operation" ("*Ce serait folie de tenter chez l'homme atteint de calculs une telle opération*"). Even the proposal to cut down upon the kidney through healthy overlying planes of tissue, to remove from its interior ca'culi, or to liberate accumulated pus, had no serious place in surgery. The accounts of the cases of the "free archer of Bagnolet,"¹ and of Hobson, the English consul at

¹ An account of his case is given by Mezeray in his "History of France." The date of its occurrence is uncertain, but it was previous to the time of Paré (1510-85). The story goes that this archer was under sentence of death for crime; but at the request of the Faculty of Paris was delivered up to them for experiment, as it was known that he had nephritic trouble. The kidney was cut down upon (so the account goes) and a stone extracted. The patient recovered and lived many years after in good health — *Dictionnaire des Sciences Medicales*, Paris, 1819, xxxv, Article, "Nephrotomie."

Venice,¹ of each of whom it was related that under peculiar circumstances a kidney had been cut down upon, stones extracted, and recovery followed, remained simply as *curiosa chirurgica*. They provoked no imitators, and awoke only remarks upon the temerity of the operators and the indefensibleness of such operations.

From the experiences of surgeons dealing with ovarian tumors, however, a suggestion as to possible work upon the kidney finally came. In 1858, Spencer Wells, and in 1862, Thomas Keith began their careers as ovariologists, and by 1870 the total number of ovariectomies by all operators in Great Britain had already exceeded one thousand. In this country, contemporary with these and working in the same field with equal boldness and success, were Atlee, Kimball, Dunlap, Peaslee, and others. In 1868 Peaslee found, after having removed a supposed solid ovarian tumor, that it was an enlarged kidney that he had taken away. Although peritonitis carried off the patient on the third day thereafter, it was noticed that an adequate urinary secretion was furnished by the remaining kidney up to the time of death.

Wells, too, at about the same time, after the removal of an ovarian cyst, found that he had in addition taken away a healthy kidney, which was inseparably adherent to it. This patient also died on the third day, but no trouble from non-elimination of the urine was experienced. Finally, however, at Heidelberg, was worked out by most careful and rigorously guarded experimentation the physiological fact that but one healthy kidney was required for the excretory needs of the body, and, further, the surgical fact was established that the methodical removal of a kidney from the human subject involved no technical difficulties that could not readily be overcome.

¹ This case occurred during the last century. A certain Mr. Hobson, English Consul at Venice, having insisted that Dominicus de Marchetti, a famous physician of Padua, should do something to relieve him of his sufferings, that physician cut down as far as the kidney one day, and the next finished by cutting into the kidney and extracting two or three calculi. The patient recovered and lived for years after with a urinary fistula, but with permanent relief from his pain.—*Bernard*, Lond. Philosoph., Trans. xviii, 333.

For a year and a half had the life of Margaretha Kleb been made miserable by a ureteral fistula, opening upon the anterior abdominal surface in the scar of a wound made for an ovariectomy, combined with an hysterectomy, in the course of which operation the left ureter had been wounded. In July, 1869, she appealed to Simon, then professor of Surgery in the University of Heidelberg, for relief. The condition that the patient presented satisfied him that relief was to be found only in the suppression of the primary source from which the urine came. Possibly at the present day an attempt at reimplantation of the ureter into the bladder would first have been made. But it is by no means certain that such a procedure, even had it been successful, would have been the best thing for the patient, for it has occurred to surgeons in these later times to find themselves compelled to finally extirpate for progressive pyelonephritis a kidney whose ureter had been satisfactorily reimplanted in the bladder months before. (See Lange's case, *ANNALS OF SURGERY*, October, 1899, p. 513.) Whatever criticism may be made, the fact remains that in this instance it was eminently true that "the end crowned the work," for, when at last the kidney was removed, the convalescence was undisturbed and full restoration to health, comfort, and usefulness followed. It is easy for us, twenty years later, to approach a nephrectomy confidently and unhesitatingly. All its problems have been worked out and demonstrated by the experience of hundreds of cases in the hands of many operators. Not so, however, with Simon at this time.

It was absolutely new ground. Would the remaining kidney be competent to the needs of the body? Could the repair of the ligated renal artery, cut off so close to the great arterial conduit, the abdominal aorta, be relied upon to stand the blood-pressure after the absorption of the ligature? Might not emboli become detached from the thrombus in the renal vein, and floating into the general blood-current provoke lesions in distant organs? Could the primary hæmorrhage be kept under control? could wounds and infection of the peritoneum be escaped? And, finally, could the deep and extensive wound-cavity be conducted to a sound healing?

With these questions unsettled, was it justifiable to subject a fellow human being to a procedure which involved them all? Not until thirty dogs had been nephrectomized by Simon and his assistants, and it had been demonstrated by the experience gained in these vivisections that in each of these points surgery was competent to secure safety, did Simon venture to advance to the supreme test upon the human being. "*Was nun aber für den Hund gilt, das scheint mir auch für den Menschen gelten zu müssen*" ("Chirurgie der Nieren," 1ste Theil, p. 12) are Simon's words in describing this part of his work.

What friend of man and of animals is there who will venture to claim that the subjection of these dogs to these experiments was otherwise than a most humane and praiseworthy act? The advantage to mankind which has proceeded from the sacrifice of these few dogs has been incalculable. Was the act a justifiable one, and is the resort of surgeons and physiologists to similar practices in the pursuit of knowledge or of manipulative skill to be condemned? Ask Margaretha Kleb, or any of the thousands of individuals who, since the publication to the world of the happy outcome of her case, have been relieved of the most atrocious sufferings and imminent death by the invasion of the surgeon's knife into the hitherto forbidden region of the kidney! It is but recently that a gentleman, the picture of health, whom I did not recognize, called upon me, and stated that his object was simply to express to me his sense of grateful obligation and appreciation for service that I had rendered him. When he had recalled himself to my memory, I found that it was a man whom I had seen but once, and that in consultation. Then he was wasted to a skeleton after many weeks' persistence of that complex of rigors and fever and sweating and malnutrition, which speaks to the surgeon so positively of internal suppuration and septic absorption. It had been my good fortune simply, as the result of my examination, to point out a kidney as the seat of this disturbance, and to urge the necessity of its exposure and incision. This had since been done by another hand, and with a result that was marvellous.

It was a veritable resurrection. And what is more rare than recovery, with returned health there remained a lively appreciation of

the guide which had pointed out to him the way to health. But it was to Simon, and to those who followed him in the difficult work of experimental investigation, that he was really indebted. Shall we ask this man, whether thirty dogs are too high a price to pay for thirty years of health and working power for a man?

The "ethics of vivisection" is a term most happily used by a recent writer in the *Edinburgh Review* to characterize the sum of the questions which in these later times have been made to gather around the propriety of subjecting lower animals to pain, maiming, or death for purposes of physiological research or surgical experiment for the benefit of man, for ethics involves not only the consideration of one's moral obligations as to the rights of others, but also of his duty in respect to himself. And what is due to man should receive as full consideration at all times as what is due to the lower orders of animals. All life is sacred, and no one feels this more keenly than the physician, who is of all men the high-priest of life. And yet the order of nature is that life, or the products of life, shall be given to perpetuate life, the lower for the higher, the older for the younger, the mature for the new-born. Is not life everywhere the same, an eternal, indestructible force, dependent for the character of its manifestations upon the quality of the material conditions by which it is environed? When these conditions are such as are no longer responsive to its stimulus, death is said to have occurred, but is there any less of life in the universe? The living cell, the biological molecule that it is, is the unit of life. And whether in the elements of that unit there be potentialities degradingly low or infinitely great, the force with which it is endowed that makes it to attain to all that is possible for it, must be essentially the same in all, and this force is what men call LIFE. But every living cell, be it vegetable or animal, contains within itself the elements of its own dissolution, sooner or later, and by its dissolution presents materials to be appropriated by other still living cells, and so the same elements anew enter into the cycle of life, and the endless procession of life goes on, immortality as brought to light by science! In this endless chain of transformations that is going on in Nature instinct, reason, custom, religion, alike, all unite to sanction

the use of the lower order of living things for the maintenance of the higher, often, indeed, the very organization of the higher makes it imperative that such should be the case. Every living herb cropped by a grazing animal, every tree cut down for fuel, every animal slain for food, every bleeding victim laid upon a sacrificial altar is an example of this righteous subjection of the lower to the higher forms of life. To use the words of the reviewer already referred to, if medicine is still further "to improve and take its place as a science, it can only be by toiling along the stony and weary path of experimental investigation. Nor need we fear that too many people will press into this path. Human nature is mostly indolent and ease-loving. Research by experiment is difficult and costly, it requires almost infinite patience, infinite hopefulness. It brings in a mere pittance of income; it requires a degree of absorption which prevents any other work being done. There need be no fear of too many people undertaking it." But may not this right to use the lower animals be abused, may not recklessness as to suffering inflicted be displayed by thoughtless or callous experimenters? Doubtless so, but it is far less in amount than the representation of ardent antivivisectionists would lead the public to believe, and for its correction an enlightened and sensitive professional sentiment is entirely adequate.

The example of Simon received no imitators for a year and a half, until finally, in March, 1871, Von Bruns, in a case of left lumbar urinary fistula, with pyonephrosis and calculous formation, resulting from a gunshot wound, in the person of a German officer, extirpated the diseased kidney. Death followed in a few hours, and at the autopsy the remaining kidney was found to be also the seat of multiple abscesses. Five months later, Simon, in August, 1871, for the first time in the history of mankind, removed a kidney on account of calculous disease pure and simple. The patient was a woman, thirty years of age, who for twelve years had been suffering in an extreme degree from the pains and disabilities incident to that condition. A resident of Savannah, Georgia, she crossed the Atlantic to put herself under the care of Simon, by whom, on the 8th of August, 1871, the affected kidney was safely removed. In his own account of the

operation Simon confesses that he approached it with very great anxiety. All previous authority had condemned such a procedure in such a condition; never before had it been attempted; not until the operation was happily finished did the apprehension leave him that he might yet find himself confronted by the conditions which his predecessors had described as insurmountable.

For three weeks the convalescence of the patient proceeded without disturbance; she was free from pain, her temperature was normal, the urinary secretion was ample, her appetite was good, the wound cavity had filled up and contracted until it was now insignificant. Simon, however, shared in an unusual degree in that spirit of the older surgeons which prompted them to examine every cavity and feel every surface with their own fingers. They called the practice training their "*tactus eruditus*." No unfortunate patient could have a cavity opened or a wound made without the by-standing surgeons being invited to put their fingers into it. And the omission to extend such an invitation was a serious breach of professional courtesy. The boldness and enterprise of this Heidelberg surgeon had carried him in this direction further than most surgeons. He had passed his hand and forearm through the anal sphincter and along the large intestine until he could feel the kidneys and liver of his patients; he had made a practice of dilating the female urethra with his forefinger and carrying the forefinger into the bladder, and by it had guided a catheter into many a ureter. Where his fingers had been previous to his approach to the bed of his now fully convalescent nephrectomized patient on this the twenty-first morning after the operation who can say. It is quite certain, however, that no special precautions to make them aseptic had been taken. The vexed questions as to the relative merits of alcohol and sublimate solution, permanganate and oxalic acid, and chlorinated lime and carbonate of soda, or as to whether the surgeons should wear cotton or rubber gloves, had not yet begun to trouble the surgical mind. So much the worse for this little woman from Georgia and her dreams of future health. As the dressings were being changed in the presence of Simon, the temptation for him to explore the wound cavity with his finger was too much for him, and in it went.

He says, in his account of it, that he explored it very carefully with his *little* finger. All the same, within a few hours the symptoms of general septic infection declared themselves by a chill and a rise of temperature to 103.5° F. (39.4° C.). For some days the battle between the body cells and the invading micro-organisms continued until both pleural cavities and the peritoneum were filled with pus, when, on the tenth day, death supervened.

Simon, himself, died from an aneurism of the thoracic aorta, in August, 1876, without again having occasion to resort to nephrectomy, but the seed which he had sown quickly sprang up and brought forth a most abundant harvest, more particularly when the possibilities which antisepsis opened to the surgical world began to be realized. Up to 1879, when I made a search through literature for cases bearing upon the one which I have already mentioned as having engaged my interest at that date, I was able to find reports of only fifteen cases of kidney removal, and in more than one-half of these the operator did not know that it was a kidney that he was removing when he did it. Six years later the number that Gross (*American Journal of the Medical Sciences*, July, 1885) was able to gather was 233. Since the latter date individual cases have ceased to be counted, the procedure has become as much an established operation of surgery as the amputation of a limb or the relieving of a strangulated hernia, and there are now many individual operators who count their cases of nephrectomy by the score. Simon did more than demonstrate by his vivisections and by his operations upon the human subject that the kidneys were within the range of surgical effort; before his untimely death he had prepared and published two parts of a systematic treatise entitled "*Chirurgie der Nieren*," the first book of this character in any language. In these were discussed first the physiological questions involved in such work; then wounds, calculi, suppuration, and hydro- and pyonephrosis. For a third part he had reserved cysts, tuberculosis, and movable kidney; but this he did not live to accomplish. It was not until ten years later that other authors began to publish systematic treatises on surgical diseases of the kidney, and then appeared in rapid succession the volumes of Morris ("*Surgical Diseases of the Kidneys*,"

1885, 12mo, 548), Bruce Clark ("Diseases of the Kidney Amenable to Direct Surgical Interference," 1886, 8vo, 176), Newman ("Diseases of the Kidney Amenable to Surgical Treatment," 1888, 8vo, 472), Tuffier ("Études expérimentales sur la Chirurgie du Rein," 1889, 8vo, 166), Knowsley Thornton ("Surgery of the Kidneys," 1890, 8vo, 102), and finally that of Küster ("Die chirurgischen Krankheiten der Nieren," I. Hälfte, 1896, 8vo, 274), the first half only of which has as yet appeared.

The two indications for which Simon first performed nephrectomy still remain in the list of the conditions for which the surgeons of the present day resort to it, but with modifications that later experience has introduced. About wounds of the ureter a considerable special surgery has since that date arisen. While by the various devices of uretero-ureterostomy and of bladder implantation the flow of urine through its natural ureteral channel has been and may be restored in the greater number of instances in which wounds of that conduit occur, there still remain certain cases in which neither of these procedures is practicable, or in which it has been neglected until by an ascending infection the kidney itself has become the seat of a suppurative process, while the offensive ureteral fistula persists. Provided the other kidney is known to be sound, the removal of the one whose ureter has been damaged is the proper thing to do. So also in those closely allied cases in which, by obstruction to the ureter, the kidney has been dilated into a huge sac-like urinal, which, though emptied by incision, degenerates into a persistent urinary fistula by reason of the continued ureteral obstruction; in these cases, too, what remains of the kidney should be extirpated.

Whether a stone-bearing kidney should be excised or not depends largely upon the condition of the kidney substance itself. Experience has shown that in the earlier period of stone in a kidney, before the kidney has become the subject of pyogenic infection, the organ may be exposed, split open, the stones removed, and sound healing with restitution to a healthy condition follow, in the great majority of the cases in which such a procedure is resorted to. To remove such a kidney, therefore, is not justifiable. Not so, however, when sup-

uration has already supervened, and a pyonephrosis as well as a nephrolithiasis has to be dealt with. A possible temporary advantage may be secured even in such cases by an incision of the suppurating kidney, removal of the stone, and drainage, but ultimately in almost all such cases extirpation of the kidney must be done.

The question of the early diagnosis of a renal calculus and of promptness of interference as soon as a diagnosis is made is thus seen to be of more than ordinary importance. For upon it depends not only the removal of the foreign body with the least amount of risk to the patient, but also the possibility of retaining for the use of the body so important an organ as a kidney.

So also in the case of tuberculosis of the kidney, it is undeniable that the earlier an organ thus affected can be totally removed the better, provided that the disease is limited to the one kidney and the other kidney is competent as an excreting organ. Excision becomes a serious matter only when deferred until the local conditions have been made difficult of management by inflammatory infiltrations and adhesions and by perirenal suppuration, and the general condition of the patient has been seriously compromised by pain, profuse and long-continued suppuration, and by absorption of retained septic products. The difficulties that attend diagnosis during the earlier period when intervention promises most are many; often the kidneys are involved as a part of a diffuse tuberculosis; often both kidneys are affected, so that little of brilliancy and often much disappointment must attend surgical intervention in this class of cases. The certain march to the grave of an unrelieved tuberculous kidney, the comparatively small risk attending excision of the part or a whole of the kidney that has not yet become the seat of suppuration, in a person whose general health is still fair, makes the early detection of kidney tuberculosis so important as to warrant resort to explorative incision for the purpose of making a diagnosis whenever such symptoms of renal disturbance as polyuria, frequent urination, transitory recurring hæmaturia, and loinache appear and persist, even though pus has not yet appeared in the urine, and no tumefaction can be felt in the region of the kidney.

Unfortunately, tubercular kidneys rarely come under the surgeon's observation until after they have become the seat of suppurative processes, and the relief of the kidney abscess has become the dominating condition. Incision for the evacuation of pus and drainage must be followed at once or later, according to the judgment of the surgeon in the individual case, by extirpation of the whole tuberculous mass, kidney and all, if recovery is to be secured. The accomplishment of total extirpation in such cases may present the most formidable difficulties by reason of the dense adhesions to surrounding structures that have formed. The immediate mortality-rate of intervention in such cases is high, but should have no influence in determining the question of radical operative interference, provided the healthy condition of the remaining kidney has been ascertained. According to the statistics compiled by Bangs, two years ago (*ANNALS OF SURGERY*, January, 1898), in about one-third of the cases operated upon a lasting recovery has followed the operation, and in an additional equal proportion of cases great improvement was secured for a time. When one considers the nature of the affection, and its rapid course to a lethal termination when left to itself, a procedure which enables the surgeon to cure one-third of the cases, and greatly improve for a time another third, is certainly worthy of all praise. A better record than this can be secured only by earlier diagnosis and more prompt surgical intervention, until that time shall come, not far distant one may hope, when the mastery of tuberculosis through internal therapeutics shall have been achieved.

Pyonephrosis, not associated with calculus nor tuberculosis, naturally calls at first for nephrotomy and drainage. This may be done without reference to the condition of the other kidney, and the earlier it is resorted to, after the symptoms of pus-retention have declared themselves, the greater the probability of retaining the affected viscus as a useful excreting organ, and the less the danger of the secondary involvement of the other kidney. I quite agree with the teaching that it is better to postpone removal till it has been demonstrated, by the lapse of time, that shrinking and final closure of the suppurating cavity will not follow the simple incision and drainage.

Before resorting finally to nephrectomy, a full determination of the condition of the other kidney must have been made, and only upon the demonstration of its competency will extirpation of the first one be proceeded with.

In the surgical practice of the present day further indications for nephrectomy are found in certain wounds and in malignant disease. Wounds of the kidney are to be treated just as wounds of any other tissue. The kidney wounded should be exposed and sutured or tamponed with a view to its preservation, if possible. A portion of its substance may be excised, but if it is much lacerated or disorganized, or if the control of bleeding has required the ligation of the renal artery, a complete extirpation of the organ must be made.

Cancers of the kidney present the same problems and respond to extirpation in the same degree as do cancers of other organs of the body. It is often the case that the carcinomatous degeneration begins and extends far without provoking special symptoms to indicate its presence, so that in the case of an internal organ, such as the kidney, by the time when the disease has become recognizable, the period when it was confined within the organ primarily affected and is susceptible of absolute removal has passed by, and the most that a surgeon can do is, by the extirpation of the primary growth, to secure relief from the pains and disabilities incident to its presence in the original location, while the dissemination and advance of the disease elsewhere are progressing to its fatal end. A very large operative mortality-rate has thus far attended the efforts at nephrectomy for carcinoma, for the reason that the patients have not presented themselves for operation, or their need for operation has not been realized, until the involvement of the perirenal tissues has become so great as to render the enucleation or separation of the mass of gross disease exceedingly difficult and most formidable as an operative procedure, while the resisting power of the patient has become reduced to a minimum. Still, in view of the absolute picture of hopelessness and great present suffering of such cases, attempts to relieve them operatively are eminently justifiable. No more brilliant achievement in surgery has been recorded than the successful efforts of Abbe in the

removal of sarcoma of the kidney. In this case a sarcomatous kidney weighing seven pounds was removed from an infant, whose weight after the removal of the tumor was but fifteen pounds. This child is still living, more than seven years later, and is in perfect health. Similar immunity from recurrence, after the removal of kidneys the subject of malignant disease for periods of from three to five years, have been reported by Dönderlein, Israel, and Schmidt.¹ One such success with its later permanent freedom from recurrence is sufficient to encourage surgeons to continue their attempts to remove cancerous kidneys, notwithstanding the little advantage which in most cases rewards their labor.

Thus much as to the general features merely of only one part of my theme,—viz., nephrectomy. But during the twenty years of this brilliant surgical epoch closing the nineteenth century the conservative surgery of the kidney has been developed to quite as marked a degree as the destructive surgery. All that has been done for the fixation of movable kidneys and the relief of the pain and disability so often attending that condition dates its beginning from 1881, when Hahn, of Berlin, published his first few cases of lumbar nephropexy.² The opening of an otherwise healthy kidney and the removal from its interior of a calculus, with preservation of the organ, was first done by Morris, of London, in February, 1880.³ The possibility of relief of nephralgia, simulating nephrolithiasis, by free division of the capsule of the kidney, with or without incision into the substance itself of the organ, was suggested by Tiffany, of Baltimore,⁴ in 1885, and demonstrated by the same surgeon two years later.⁵ The value of the procedure has been verified by the experience of many other surgeons. Plastic operations on the pelvis of the kidney

¹ Heresco, *De l'Intervention Chirurgicale dans les Tumeurs Malignes du Rein*, Paris, 1899.

² Hahn, *Die operative Behandlung der beweglichen Niere durch Fixation*, *Centralblatt für Chirurgie*, 1881, No. 29.

³ Morris, *British Medical Journal*, 1880, ii.

⁴ Tiffany, *Transactions American Surgical Association*, 1885, p. 134.

⁵ Tiffany, *Transactions American Surgical Association*, 1887, p. 167.

for the relief of valvular obstruction to the inlet to the ureter, producing intermittent hydronephrosis, is of still later origin, being due to the work of Fenger,¹ of Chicago, and of Mynter,² of Buffalo, so late as 1893.

The methods of diagnosis have improved *pari passu* with the extension of operative indications and the perfection of operative technique. Surgeons have learned to better interpret subjective symptoms. Kidney abscesses are less frequently lost sight of under the mistaken cloak of typhoid or malarial fever; the gastric crises and abdominal distress of a downward dragging kidney are less frequently classified as digestive and neuralgic manifestations, the bleeding and tenderness of a calculous kidney are less frequently referred to intrinsic circulatory disturbances. For the discovery and analysis of objective symptoms the senses, the arts, and the sciences have all been brought into requisition. Chemistry has lent its test-tubes and reagents, Optics its microscope and reflecting mirrors, Physics its centrifugator, Biology its guinea-pigs and dogs for the injection of suspicious sediment, Bacteriology its plates and incubators, Mechanics its catheters and cystoscopes and segregators, and Electricity its light for the illumination of the hidden outlets of the ureters and for the development of the rays of Röntgen, while, for the preservation of the shadows which these develop, Photography has brought its most sensitive plates. Over and above all these material aids to direct them with eye and hand, and to interpret their results have arisen observers trained, skilful, judicious. The natural result has been an earlier and more correct appreciation of the existence of the conditions calling for surgical interference in so hidden and deep-lying an organ as the kidney, and following upon this a greater degree of success in dealing with them. To this witness the fact that of the 233 cases of nephrectomy collected by Gross, in 1885, in 104 of them death was the result, a mortality-rate of nearly 45 per cent. ! But the most recent statistics of a great clinic here, in New York, the

¹ Fenger, Chicago Medical Record, March, 1893.

² Mynter, ANNALS OF SURGERY, December, 1893.

Roosevelt,¹ give as the result of the thirty-two nephrectomies done in the period from 1890 to 1898, inclusive, but six deaths,² a mortality-rate of less than 19 per cent. Even more suggestive as to the possibilities of interference in selected cases are the figures of the Presbyterian Hospital,³ where of the seventeen consecutive nephrectomies done in the period from 1893 to 1896, *all* recovered, the mortality-rate was zero !

The future extension and most beneficent results of renal surgery depend upon the perfection of the methods of diagnosis, whereby the surgical diseases of the kidneys shall be detected in their earlier stages. Questions of operative technique enter but little into the discussions of the present moment. The trained judgment of the experienced surgeon, with all the resources of the thoroughly furnished clinic at his command, is but little troubled as to location, direction, or extent of his incisions. Having clearly in his mind the condition with which he is dealing, and the work which he is to accomplish, he proceeds straight to his end, exposing quickly and fully the seat of disease, controlling hæmorrhage, limiting shock, avoiding infection, and completes his work thoroughly, influenced as to the details of his procedures more by the particular conditions of the individual case than by the directions of authorities. In renal surgery the matter which most engages the surgeon's thought is the demonstration of the existence of the disease in the particular organ ; next comes the question, What is the condition of the other kidney? To the perfection of methods whereby with facility and positiveness these questions can be answered the learning and ingenuity of surgeons may well be given. In this direction to-day lie the remaining problems of the surgery of the kidneys.

LEWIS STEPHEN PILCHER.

¹ Johnston, *ANNALS OF SURGERY*, March, 1889, p. 339.

² Of these six deaths three were in cancer cases, a fourth was in the person of a man already nearly moribund through internal bleeding from a ruptured kidney, the fifth was already in a state of desperate prostration from sepsis, and in the sixth case the kidney that was left proved to be already destroyed by disease. (See Johnson's Report, *loc. cit.*)

³ Hawkes, Presbyterian Hospital Report, 1897, p. 234.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. Antitoxin Treatment of Tetanus. By DR. HABERLING (Rostock). After two successful personal experiences with antitoxin, and from a study of forty-two published cases thus treated, the author is of the opinion that inaccuracies and meagre details as to variety of the antitoxin and the quantity employed afford opportunities for but approximate conclusions.

In the first instance, we must bear in mind the difference in the prognosis of cases presenting tetanus with an incubation of more or less than ten days. Excluding one of doubtful origin among the forty-four cases subjected to Behring's antitoxin treatment, twenty-four were cured, nineteen died, equivalent to 55.8 per cent. cure and 44.2 per cent. mortality. Of twenty-three cases with an incubation inside of ten days' acute tetanus, but ten were cured, or 43.5 per cent. cure and 56.5 per cent. mortality; whereas among the remaining cases of longer incubation than ten days, but six deaths occurred,—*i.e.*, a mortality of but 30 per cent. In fourteen instances the suggestion of Behring and Knorr to inject the tetanus serum inside of thirty-six hours was carried out. Ten of these were acute cases, and but four were cured.

The quantity used varied from two and five-tenths grammes of dried substance (125 U. I.) to two by twenty-five cubic centimetres of fluid serum (500 U. I.). Two observers report good results from repeated injections. The severe symptoms abated gradually, never suddenly. Among unpleasant effects recorded were skin eruptions in great variety; erythema, eczema, and exanthematous lesions; elevation of temperature, failing pulse, collapse, diarrhœas, but never any harmful effects upon any of the organs. In view of a mortality

of but 43 per cent. in the acute cases, a further trial of the injections in larger doses is commendable, supplemented, however, by narcotics, to which the author in part attributes the cure in his cases. The treatment of the wound must not be neglected.

The animal experiments of Knorr having proven that by the increase of the quantity of antitoxin injected the possibility of a cure is enhanced, we should use larger doses in acute cases the later they are subjected to treatment. Subcutaneous injections are the best. Intravenous do not act better. Author does not hold a good opinion of intracerebellar injection, and in concluding highly recommends the injections of large quantities, as practised in America, and thinks that the small quantities used heretofore alone account for the relatively poor results.—*Beiträge zur klinischen Chirurgie*, Band xxiv, Heft 2.

II. Operative Treatment of Aneurisms. By DR. HOFFMANN (Breslau). This procedure, practised by Mikulicz in two cases of aneurism, is a modification of Antyllus's operation, executed in two sittings.

The first step consists in ligating the vessel, according to Anel or Hunter. If the aneurism does not shrink very soon, and no local wound infection supervenes, the sac is split, the clots are turned out, and the wound is sutured with silk, and a compressing bandage is applied over the dressing; the after treatment comprises the wearing of an elastic bandage for several months.

Author claims as advantages for this method, a healing by primary union, less sacrifice of accompanying vessels, and therefore diminished chances of gangrene. Both steps may be performed with the aid of local anæsthesia. To guard against infection of the skin the sac should be incised by a route where the resistance of the overlying skin has not been impaired by the pressure of the aneurism.

The one case operated was a ruptured aneurism of the popliteal artery, the other case was a traumatic aneurism of the femoral.—*Beiträge zur klinischen Chirurgie*, Band xxiv, Heft 2.

MARTIN W. WARE (New York).

HEAD AND NECK.

I. Operative Treatment of Severe Occipital Neuralgia. By PROF. F. KRAUSE (Altona). Three cases of severe occipital neuralgia, extending over the areas innervated by the plexus formed by the posterior divisions of the occipitalis major, minor, tertius, and auricularis magnus, were subjected to operation. The attacks presented features similar to those of trigeminal neuralgia. Mastoid sclerosis, cervical spondylitis, myositis, neurasthenia, and hysteria have to be considered in differential diagnosis.

Dissections by Krause have shown a great variability in the formation of the plexus, its distribution, and the point of exit of the nerves on the surface, differing even in the same subject on both sides. This led to the choice of an incision covering all possible anomalies. Author makes a curved incision, starting from the external occipital protuberance, passing horizontally outward in a slight curve two centimetres beneath the mastoid process, and thence along the posterior border of the sterno-mastoid; thus the cicatrix is covered in greater part by the hairy scalp. Incision at first is only to penetrate to the subcutaneous tissue in order to avoid injury to the nerves, which are subsequently traced to their exit from the foramina and divided, though the ganglia of the two occipital nerves lying outside of the spinal canal were not resected. Neurorrhesis (Thiersch) is dangerous, as traction may injure the spinal cord. The only hæmorrhage that is annoying is that from a plexus of veins situated about the vertebræ. The occipital is easily ligated, and the relatively near vertebral artery is protected by the arches. In following these nerves the spinal accessory may have to be divided, and the proximity of the vital nerves and vessels of the neck calls for great caution. The division of anterior motor branches left the muscles unimpaired, owing to their free, supplementary innervation by a free anastomosis. The wound was always drained at two angles. In a woman of fifty-four years, and a man of forty-two, there were no return of symptoms one and a half years after operation. In the instance of a girl, thirty-

three years of age, neurasthenia is held responsible for the failure. Only after palliative measures have failed is operation indicated.—*Beiträge zur klinischen Chirurgie*, Band xxiv, Heft 2.

II. Goitre Operations at the Heidelberg Clinic, 1888–98. By DR. A. SCHILLER (Heidelberg). This summary embraces 869 goitres, of which thirty-three were malignant, six Basedow, fourteen acute inflammation of the thyroid, and the remainder simple goitres. The special predilection of goitres in the female sex and at puberty is again demonstrated, and in addition the greater frequency of their appearance during the summer months.

As for therapeutic measures, thyroidin is regarded as a more efficient agent than iodine. Two hundred and thirty-six benign goitres were operated, two by puncture and iodine injection combined, sixty-four enucleations (Socin), 174 extirpations, and one tracheotomy. Puncture, injection, incision, and drainage, now obsolete, are replaced by Socin's method.

Narcosis.—Chloroform-morphine most often used. Incision varied greatly, the most common being a curved incision along the border of the sterno-mastoid. The time of cure averaged eleven days for enucleations, and fourteen days for strumectomies. Drainage was always resorted to for three days. The mortality embraced four deaths from pneumonia, one by poisoning (?), and one case of chloroform death in which a persistent thymus was found.

The post-operative complications encountered were secondary hæmorrhages, temporary laryngeal disturbances due to contusions, hæmorrhages and infiltrations about the nerve. Tetany occurred four times where the removal of the gland was extensive, and twice it was associated with myxœdema. In one instance an intra-abdominal transplantation of a freshly removed adenomatous thyroid failed to cure, but with the recurrence of the thyroid growth a cure set in. The simple goitres recurred in 20 per cent. of the cases.

The strumites were, with the exception of one case, secondary infections of pre-existing goitres, three infected by puncture, two were metastatic, and the remainder were unaccounted for. These

cases too were subjected to extirpation, unless the poor general condition permitted only of puncture and drainage.

The four cases of Basedow were all in females of a neuropathic taint. For the relief of these ligation of the thyroid arteries alone was resorted to.

The malignant growths, more common between the ages of fifty and sixty, were most frequently represented by sarcomata, and merely in one-half the cases was the diagnosis made. The difficulty of strumectomy in these cases is gathered from the necessity of resecting the internal jugular vein five times, and often extensive resections of the muscles had to be resorted to in extirpating the glands. Tracheotomy was thrice performed. The mortality was 15 per cent. Five cases were free from recurrences up to four and a half years; fifteen months may be accorded as the average viability after recurrences. Better results are only to be expected from early diagnosis. Contraindications to operation are metastases associated with venous thrombosis and absence of the carotid pulse: on the other hand, if the tumor is immovable, adherent to vessels and larynx, and the carotid pulse still persist, there is no contraindication.—*Beiträge zur klinischen Chirurgie*, Band xxiv, Heft 3.

MARTIN W. WARE (New York).

ABDOMEN.

I. Perfected Gastro-entero-anastomosis. By PROF. LÜCKE. Kausch has demonstrated that bile was found in the stomach in all the cases of gastro-entero-anastomosis which he examined in the Breslau Clinic. The author, therefore, believes the pancreatic juice is also present in the stomachs of these cases. It is contended that even though the presence of these secretions may not be harmful, yet a method which permits this can scarcely be called ideal. The subject has not been considered for a sufficient length of time to demonstrate the entire harmlessness of their presence.

On examining the various procedures in regard to this point, it is found that that of Doyen is the most rational. This author combines gastro-enterostomy with lateral intestinal anastomosis and the

division of the afferent loop above the site of the latter procedure, the divided ends being closed. Yet even in this method bile and pancreatic juice propelled towards the stomach by the peristalsis of the afferent loop must suddenly meet the gastric contents passing in the opposite direction. Lücke believes that this may render the evacuation of the stomach difficult. Gastric contents may even pass through the lateral intestinal fistula into the afferent loop.

It is proposed to avoid both complications by applying the lateral intestinal anastomosis to both the loops in the direction of the peristaltic wave. The idea is illustrated by several schematic drawings. In addition, the division of the afferent loop (Doyen's) or resection of this portion is advocated. In cases in which the posterior stomach wall is readily accessible and in which elimination or resection of a portion of the afferent jejunal loop is intended, the author prefers posterior gastro-enterostomy; in other cases anterior gastro-enterostomy. In the former case care must be taken that the intestinal anastomosis is at least twenty centimetres distant from the gastro-intestinal fistula. In addition, the afferent loop must lie for some distance parallel with the efferent loop, that is, towards the pelvis. To attain this the two loops may be sutured to each other for a distance of four centimetres above the anastomosis. In anterior gastro-enterostomy resection or elimination cannot be performed.

This procedure has not as yet been employed upon the human subject. It is not available in cases in which a rapid operation is essential; nor in those in which the chronic function of the stomach is unimportant, and in which the motor function only is to be improved, as in carcinoma of the pylorus.

It is indicated in all cases in which the posterior stomach-wall can be readily reached and in which the patient's condition warrants the taking of additional time. Atony of the wall of the stomach associated with stenosis of the pylorus should give good results with this method.—*Wiener klinische Wochenschrift*, 1899, xx.

II. Technique of Gastro-enterostomy. By DR. MAX RUTKOWSKI (Cracow). To be really practical, a given method must

in the first place be uncomplicated, and in the second place must offer as little real injury to the patient as possible. Furthermore, it must permit direct reliable outflow of the stomach contents into the efferent bowel, and the possibility of forced nourishment immediately after the operation. The author believes he has answered all these demands by the following procedure.

He first performs gastro-enterostomy after Wölfler's first method. A few centimetres above the gastro-intestinal fistula the stomach-wall is incised. Through this opening a drainage-tube is introduced into the stomach, and through the gastro-intestinal fistula into the efferent jejunal loop. The stomach is sutured around the tube by either Witzel's or Kader's method. The tube is removed in ten days. The resulting fistula closes in about one week. The procedure thus combines Wölfler's gastro-enterostomy with Witzel's or Kader's temporary gastrostomy for the purpose of introducing a drainage-tube into the efferent jejunal loop. This additional procedure is free from danger, it does not take longer than five minutes, and does not complicate in any way the main operation.

By this means the stomach is left at rest, the patient being sufficiently nourished through the drainage-tube. The gastric juice easily flows along-side the tube into the bowel. In addition the tube fixes the efferent loop in its proper position and prevents kinking or the formation of a spur.

The method has been used in three cases. (1) J. W., fifty-three years of age, suffering from carcinoma of the pylorus. June 22, 1899, the stomach was resected. On account of the extent of the resection the duodenum could not be fastened into the gastric wound. Gastro-enterostomy after von Hacker and temporary gastrostomy after Kader were performed, both operations taking twenty minutes. On the tenth day the tube was removed. Four days later the resulting fistula had completely closed.

(2) M. S., twenty-four years of age, suffering from ulcer of the pylorus and myocarditis. July 7, 1899, Wölfler's and Witzel's methods were employed, the operation occupying half an hour. The

tube was removed on the tenth day. The fistula was closed by the seventh day following.

(3) M. K., thirty-four years of age, suffering from carcinoma of the pylorus, with marked cachexia. July 8, 1899, Wölfler's and Witzel's methods were employed, the operation taking thirty minutes. The tube was removed on the tenth day, and the resulting fistula was completely healed seven days later.

The post-operative course in all three cases was perfectly satisfactory. Strength increased rapidly. No vomiting occurred at any time.—*Centralblatt für Chirurgie*, 1899, xxxix, 1057-1059.

RUSSELL S. FOWLER (New York).

GENITO-URINARY ORGANS.

I. Operations for Glandular Hypospadias. By DR. WATTEN (Lodz, Poland). Formerly operations for the cure of glandular hypospadias were rarely successful, every failure leaving the parts in a less favorable condition for future attempts. Success depends primarily upon the exactness and solidity of the suturing. The new method proposed by Carl Beck (*New York Medical Journal*, January 29, 1898), which did not aim at the formation of a new urethra, but rather the prolongation of the existing one to the normal situation, was a great advance. A good result can be secured easily and reliably by the method which was recently proposed almost simultaneously by von Hacker (*Beiträge zur klin. Chir.*, Vol. xxii, Fasc. 1) and Bardenhauer (*Cent. f. Chir.*, 1898, xlv). Beck had already applied this method. It consists in freeing the lower portion of the urethra and pulling it through a canal which is formed in the glans. Bardenhauer uses a trocar for the formation of this canal; von Hacker and Beck use the knife. The method is certainly an excellent one for the treatment of hypospadias of the glans. Nevertheless, the author does not agree with König that "it is preferable to all other methods hitherto recommended." Two conditions are necessary for its performance,—that the furrow in the glans is not too deep and that the urethra can be freed and sufficiently

stretched. When either of these conditions is absent the operation may fail, as shown by the following case.

A boy of eight years, suffering from enuresis nocturna, was subjected to rather a remarkable cure by the man to whom he was apprenticed. A string was tied around the middle of the penis and left on over night. In the morning it was found impossible to remove this thread, so it was left on until it finally fell off spontaneously. In the meantime, an opening resulted close behind the thread, through which urine dribbled. About two months later the boy was brought to Watten. Examination revealed that the peripheral portion of the urethra ended centrally and was entirely impervious. At the point where the thread had been lying there was a broad cartilaginous thickening with a deep furrow in its centre. The opening on the inferior surface of the penis was the size of a pin's head. It led into a small fistulous tract. In the operation for this condition a piece of the urethra was resected, the remaining portion, between the external orifice and the suture line, amounting to upwards of one centimetre. Evidently in this case, and in similar cases, the von Hacker-Bardenhauer method is not applicable. The author used Thiersch's method. The result was an entire failure. After an interval of several weeks the following method was used with success.

The skin incisions are the same as in the von Hacker-Bardenhauer procedure, a vertical incision from the external orifice of the urethra and along its course, and two lateral incisions separating the skin of the penis from the glans. The lateral skin flaps are dissected back from the urethra. The second step consists in the formation of a flap of mucous membrane from the inferior surface of the glans. Beginning at the tip of the glans the mucous membrane is incised on each lateral aspect and loosened. This flap is made as broad as possible, and one or two millimetres in thickness. When the base of the glans is reached the urethra is separated from the lower surface of the penis for the entire length of the skin incision. In this manner a flap of glans tissue is formed, lined with mucous membrane, the urethra forming the pedicle of the flap. This flap is to be employed in lining the new urethra. The denuded surface of the glans is deepened longi-

tudinally in the middle line, and in the furrow thus formed is placed the flap of mucous membrane. Two or three sutures fix this at the apex of the glans. A small Nélaton's catheter is now introduced into the urethra. The final step consists in the application of the sutures. Care must be taken that the distal end of the original urethra lies within the denuded area of glans substance. This is easily permitted by the previous freeing of the urethra. One or two sutures suffice to retain it in position.

By this method, the author claims that a urethra is formed which is lined throughout with mucous membrane, with the possible exception of a small place on the inferior surface at the site of the former orifice. The author considers that his method strengthens a point which is generally the weakest,—*i.e.*, the corona glandis. He advocates it for cases in which the von Hacker-Bardenhauer method is for some reason inapplicable.—*Centralblatt für Chirurgie*, 1899, xxxviii, 1036–1039.

[In this article the author should have given the credit of the original procedure to Carl Beck and not to either von Hacker or Bardenhauer.—R. S. F.]

RUSSELL S. FOWLER (New York).

EXTREMITIES.

I. Tuberculous Osteomyelitis of the Diaphysis of Long Bones. By DR. H. KUTTNER (Tübingen). This most rare form of bone tuberculosis is encountered as a circumscribed or diffuse inflammation of the marrow of the diaphysis, the epiphysis being intact, but occasionally the primary process of the shaft invades the epiphysis also. The sequestra are small; tubercular abscesses also occur, and the spina ventosa common to the short bones is more frequent in the radius, ulna, and fibula than in the humerus and tibia.

Clinically this variety of osteomyelitis is confined to children under six years of age already afflicted with other tuberculous lesions. An exceptional instance in which the osteomyelitis constituted the primary invasion is detailed by the author. Diagnosis can be but

tentative as in this case. The finding of small sequestra, very carious, first aroused suspicion. The course of the disease coincides with that of subacute infectious osteomyelitis. Syphilitic osteomyelitis is excluded by its lack of acute manifestations and but rarely forming fistula or going on to necrosis.

Prognosis is unfavorable because of the tubercular nature of the lesion, and because the patients have, as a rule, multiple lesions. A localized process offers a more favorable prognosis than the diffuse variety.

Therapeutic indications are the same as in infectious osteomyelitis, and the preservation of the periosteum is of the greatest importance.

The secondary tuberculous osteomyelitis is an infection per continuity from the epiphysis or the synovial membrane. Two varieties, caries carnea exclusively confined to the humerus, and a progressively infiltrating tuberculosis, are both described by König. The second variety does not cover the ordinary infection extending to the diaphysis contiguous to the epiphysis, but refers to an extensive involvement of the entire marrow of the shaft. In five instances recorded, four times amputation was performed. All of these cases were between forty and fifty years of age.—*Beiträge zur klinischen Chirurgie*, Band xxiv, Heft 2.

II. The Operative Treatment of the Musculo-Spiral Nerve injured in Fractures of the Humerus. By DR. G. RIETHUS (Leipzig). In the clinic at Leipzig, from 1860 to 1898, amongst 319 cases of fracture of the humerus seventeen cases (4.1 per cent.) of musculo-spiral paralysis were encountered, and in nine instances the fracture was situated at the middle of the humerus. In comparison, the statistics of Bruns offer a collection of 866 fractures of the humerus, with seventy-three paralyses associated with fracture of the mid-humerus in more than 50 per cent. of the cases.

Aside from the location of the fracture the nature of the violence is accountable for nerve injury, and both primary and secondary musculo-spiral paralysis ensue when the violence is not merely spent in causing fractures but aids in the dislocation of the fragments; there-

fore torsion fractures and fractures with great displacement are more frequently met with in musculo-spiral paralysis.

Nerve palsies may be either primary or secondary. The former occur immediately after the injury, and the latter at remote periods. In the first instance the continuity of the nerve may be intact, its fibres merely contused and lacerated in part by the fragments or compressed between the fragments, or the continuity of the nerve may be completely severed.

Accordingly the symptoms varied in the eight cases of primary paralysis from transient paresis to complete abeyance of the motor sensory function of the nerve; of the latter examples, four times the continuity was preserved, and three times the nerve was severed. Four cases recovered spontaneously. In four other instances operation was resorted to in order to free the nerve from the callus; once the nerve was sutured with complete restitution in nine months; once five centimetres of the humerus were resected to approximate the nerve separated seven centimetres with complete recovery in two years; to accomplish this same end the humerus was displaced laterally, and here complete recovery also set in after one year.

The motor paralysis, as a rule, was a typical drop-wrist, the sensory disturbances, however, were very variable. Thus paræsthesia and anæsthesia set in later, and in no instance did the anæsthesia extend over the entire areas innervated by the musculo-spiral, thus speaking for a collateral sensory nerve supply. This *sensibilité supplée* (Letievant) accounts for a seeming restitution of the nerve function if estimated by an apparent earlier return of sensation. In two instances a total area of anæsthesia existed between the first and second metacarpal bones; this Letievant called the *punctum maximum*. No vasomotor disturbances are recorded. The exact diagnosis of the nature of the nerve injury is impossible, as all degrees of injury may provoke the same symptoms, yet with great displacement of the fragments and drop-wrist contusion may be assumed, and if in addition there are great sensory disturbances with a *punctum maximum* a complete severance of the nerve is most likely.

Treatment should at first be expectant; but if the paralysis is

progressive, or if at the time of union it is stationary, operation is to be resorted to. Immediate nerve suture must be performed if the diagnosis of severed nerve is made.

Secondary palsies are due to compression of the nerve by the callus against the shaft, or included in the callus, or stretched out over it, in consequence of which the disturbances set in later than in the primary palsies. There may be combinations of primary and secondary palsies: the first effects due to contusion, the subsequent due to compression. Motor and sensory disturbances set in simultaneously in the secondary paralysis.

As secondary paralyses never recover spontaneously, operation is always indicated, and, as the onset of the paralysis is so insidious, operation should be timed early, yet late interference may prove beneficent.

Appended is a list of thirty-six primary and secondary paralyses. —*Beiträge zur klinischen Chirurgie*, Band xxiv, Heft 3.

III. Osteoplastic Intercondylar Amputation of the Thigh according to the Ssabanejeff-Abrashanow Method. By DR. H. HILGENREINER (Prague). Ssabanejeff's method is thus rendered by the author. An anterior flap is outlined extending one inch below the tuberosity, and a posterior flap shorter by one and one-half inches. The joint is opened from behind. The condyles of the femur are sawn across, and now a segment of bone to correspond with this surface is sawn out of the head of the tibia and left in contact with the anterior flap, which osteo-cutaneous flap is then turned back against the femur and sutured.

Abrashanow obtains his bone segment from the posterior half of the head of the tibia, the anterior flap being made shorter on this account than the posterior.

The advantages claimed for these methods are: (*a*) there is a primary closure of the medullary canal by a bony flap; (*b*) the supporting surface of the skin is free from any cicatrix; (*c*) the skin, bearing the weight and pressure of the stump, is in natural relation to the transplanted bone; (*d*) finally, the preservation of the tendinous

insertions of the muscles of the thigh is supposed to prevent in part an atrophy of the muscles.

Gritti's operation enters closest into competition with these methods. The author thinks the disadvantages of it are: that the size of the patella and the section of the femur vary so that the patella is given to dislocation; that the retained synovial bursa and membrane of the joint frequently give rise to trouble; and that the cicatrix resulting from the incision is in the pressure-line of the stump. The choice of an amputation in injuries of the leg are thus formulated. If there is sufficiently healthy skin, a high amputation of the leg is indicated; if not, and the head of the tibia is healthy, the Ssabanejeff-Abrashanow method is in place; this requisite failing, Gritti's method is to be considered along-side of the transcondylar (Carden) or supracondylar (Stokes) methods.

Six of these intercondylar amputations were performed by Prof. Wölfler; four for extensive ulcerations of the leg, two for compound fracture of the leg. In this series one death was caused by amyloid disease; a few times there was marginal necrosis attributed to the use of Esmarch bandage or too tight a dressing; once the segment of bone was dislocated.—*Beiträge zur klinischen Chirurgie*, Band xxiv, Heft 3.

MARTIN W. WARE, New York.

ORTHOPÆDICS.

I. A Contribution to the Study of Tendoplasty. By DR. H. GOCHT (Würzburg). At Hoffa's clinic nineteen patients were subjected to this operation, their ages varying from nine months to twenty-four years. Twenty one times transplantation was performed, —for thirteen infantile paralyses, three traumatic paralyses, two cases of cerebral paralysis, and one congenital spastic paralysis.

Gocht divides the methods of grafting into active and passive. In the former a functioning tendon in part or wholly divided is attached to the tendon of a paralyzed muscle.

The plan of operation must be thoroughly predetermined, which necessitates an exact study of the range of function of the intact

muscle, and, furthermore, a careful electrical reaction has to be made to ascertain fine distinctions between totally and partially paralyzed muscles of a group, since it has been shown that the latter recover their normal range of function when their relations are bettered by preliminary operations on those antagonistic tendons which subject them to strain and tractions. If all this be accomplished, the incision can be small and limited to tendons, otherwise a larger incision is necessary to visually inspect the muscles to learn whether they are atrophied or not.

Accordingly, *rédressement* should precede all tendoplasty, aided, if necessary, by tenotomy, tendon shortening or lengthening. A primary union alone can give good results, wherefore a rigid asepsis is a *sine qua non*. To further this end silk was universally employed. The first plaster dressing was cut down after two weeks, and another applied to be left on for four weeks; the corrected positions subsequently are maintained by strapping with adhesive plaster, and active motions and massage kept up for some time. Passive motion is only indulged to the extent to outline the motion it is desired to be performed. The details practised in each case are rendered very minutely, and are worthy of perusal by those specially interested in this subject.—*Zeitschrift für Orthopädische Chirurgie*, Band vii, Heft 1.

MARTIN W. WARE, New York.

RECTUM AND ANUS.

I. The Amputation of Prolapse of the Rectum. By DR. TH. v. DEMBOWSKI (Wilna). At the last congress of the Deutsche Gesellschaft für Chirurgie in Berlin, Ludloff demonstrated that, according to the experiences of the Königsberg Surgical Clinic, the indications for amputation in cases of prolapse of the rectum could be much restricted. While it is true that many of these cases can be cured by bloodless operations, and others may be cured by means of colopexy, there yet remains a considerable number of cases in which operation cannot be avoided. Firstly, there are those cases in which the chronically prolapsed rectum is inflamed, ulcerated, and thickened, and in which reposition is impossible. Secondly, those in which the prolapse

is the result of a malignant tumor. In such cases the patients will usually be much debilitated, the slightest loss of blood being dangerous. Two years ago the author met with such a case ; prolapse of the rectum occurring at every stool. On the prolapsed gut was situated a tumor, the size of the first, which bled on the slightest touch, apparently a villous carcinoma. It was evident that the only treatment that could be employed in such a case was amputation of the entire mass.

In order to avoid loss of blood, and at the same time prevent subsequent stricture formation, the following procedure was employed.

The prolapsed rectum was transfixed near its base with a needle twenty-five centimetres long and four millimetres thick. This was done in a direction from one tuber ischii to the other. The needle was caught with the second and third fingers of the right and left hands in the interior of the rectum, and the anterior and posterior rectal walls spread along the needle. The rectal walls thus stretched transversely were secured independently and solidly to the needle by means of two iron clasps about as long and thick as the needle, the one anterior and the other posterior to the needle. These were fastened to the needle by means of strong ligatures. The rectum was then cleansed and the prolapse amputated with a long sharp knife about one centimetre in front of the iron clasps. Continuous irrigation was employed. A clean cut surface resulted. The anterior slit in the peritoneum was carefully sutured. All visible vessels were ligated. The anterior clasp was slowly loosened and the remaining vessels ligated. The entire anterior half of the wound was then sutured. The same procedure was carried out in regard to the posterior half of the incision. The circular suture resulting was powdered with iodoform and reduced within the anus.

The entire operation was so clean and the loss of blood so slight, that the author highly recommends this slight modification.—*Centralblatt für Chirurgie*, 1899, xxxix, pp. 1059-1061.

III. The Extirpation of Cancer of the Rectum by the Abdomino-Perineal Route. By M. QUENU, Paris.

The author divides rectal carcinomata into three classes, according to the location,—low, middle, and high. For the first group he advocates the perineal route; for the third, the abdomino-perineal route. For the second group, Quénu formerly operated by the sacral route, Kraske's operation. Lately he has completely renounced this, as he claims that the rectum can be resected from the perineum for a distance of fifteen or sixteen centimetres. The rectum must be resected at least six or seven centimetres above the growth, so the perineal route is only applicable in those cases in which the upper boundary of the tumor lies within eight or ten centimetres of the anus. In all other cases the abdomino-perineal route is to be employed. By this method, while it is true that the patient is left with a permanent artificial anus in the iliac region, the prospect of radically removing all of the growth is much more favorable than by other methods. It is conceded that this operation is more formidable than others, but with modern operative technique this should not be an objection. There are two conditions which are essential for the success of the procedure, asepsis both during the operation and throughout the after treatment, and hæmostasis. To insure the latter, ligature of both internal iliacs is recommended.

Quénu proceeds as follows: The abdomen is opened in the median line with the patient in the pelvic position. The right internal iliac artery is exposed and ligated one centimetre below the bifurcation of the common iliac. Care must be taken to avoid the ureter. This may be avoided by incising the peritoneum somewhat internal to the vessels and then palpating the artery. The left internal iliac is then ligated. In order to reach this it is either necessary to incise the mesosigmoid overlying it and then incise the parietal peritoneum, or, in case of a long mesosigmoid, the flexure may be turned upward and the vessels approached directly. While ligating the vessels, enlarged glands are searched for and removed. Having protected the abdominal cavity against infection, the sigmoid flexure is divided between two strong silk ligatures. The cut edges are disinfected and wrapped in iodoform gauze. The upper end of the sigmoid is at once sutured in an incision in the left iliac region. The

ligature which closes its lumen is usually not removed until the third day. While an assistant puts the rectum and sigmoid upon the stretch by drawing it in the direction of the pubes, the mesorectum at either side is freed and the band which contains the hæmorrhoidal vessels ligated. This is felt by the finger passing downward from the promontory of the sacrum. The rectum is bluntly loosened from the sacrum as far in a downward direction as possible and the rectovesical or recto-uterine pouch incised at once, if possible. The rectum is wrapped in gauze and the abdominal wound closed. The bowel is loosened completely from below and removed. The resulting cavity is tamponed and the skin wound partly sutured.

The author claims for this method, certainty of asepsis, radical removal of all affected tissue, and consequently better prospects for permanent cure, rapid recovery after the operation, and the absence of shock.—*Bulletin et Mémoires de la Société de Chirurgie de Paris*, xxiv, 706.

RUSSELL S. FOWLER (New York).

REVIEWS OF BOOKS.

SURGICAL ANATOMY. A Treatise on Human Anatomy in its Application to the Practice of Medicine and Surgery. By JOHN B. DEEVER, M.D. In three volumes. Vol. i. Philadelphia: P. Blakiston's Son & Co.

It is a difficult matter for any man to write a book on this subject which shall contain much original matter. The path is one that has been well trod, and in acknowledging his indebtedness to such men as Holden, Heath, and others, the author anticipates the perfectly natural criticism that he is only following where others have led the way. This work is conceived on the general plan of Holden, of which it is an amplification; but it is Holden glorified, a Holden in purple and gold. The publishers state that this is the first work of the kind ever attempted in America. We must, however, remind them of the beautiful volumes of McClellan, published for him by the Lippincotts in 1896. The two works, written from somewhat different stand-points, fairly represent what American publishers can accomplish in this difficult branch of book-making. The later work of Deever certainly excels its predecessor as a specimen of the printer's and binder's art. It is seldom that any publisher is willing to invest a sum sufficient to produce a volume such as this, which delights the eye as one glances over its pages. The type is evidently new, and of a pleasing size and style. The paper is of unusual quality, and adds to the artistic character of the work. We think that these matters are noteworthy, for they are not, as a rule, things about which the publisher of a medical work concerns himself; yet they add much to the pleasure of possession, and rejoice the artistic sense of which the world, particularly that part of the world engaged in publishing medical works, supposes doctors to be destitute. Mc-

Clellan and Deaver have, as has been said, attacked the problems of surgical anatomy from somewhat different stand-points. It is conceded that it is difficult to write a text that shall differ much from that of the pioneers in this work. Therefore, it is the plates which represent the author's real work, and which, the results of dissections, must possess an originality of their own, and represent individual ideas of teaching better than the written text. McClellan has striven to faithfully represent his dissections exactly as they appeared, calling to his aid the camera and the brush; yet many of his plates, exquisite as they are, do not clearly convey to a novice the information he requires, for the reason that a photograph can never adequately represent on a flat surface the different planes of a dissection, a matter of the utmost importance in surgical anatomy. Thus, while McClellan's plates are of great artistic value, they lose something of teaching power, because it is impossible in a photograph to emphasize the points of a dissection which most need elucidation. It is, perhaps, for this reason that Dr. Deaver has departed from the strict accuracy of the photograph, and given to many of his drawings a somewhat diagrammatic appearance. Many of Dr. Deaver's plates are highly artistic, some are distinctly inartistic, but they are all clear, and teach exactly what they are intended to teach, so that it is impossible for the poorest tyro not to understand the relations of the illustrated structures. In the interests of clearness, we suppose, the arteries have been drawn with a series of parallel rings, so that most of the larger vessels look like tracheas which have gotten lost to reappear in strange and unaccustomed places, while the smaller branches seem to have become the seat of a series of miliary aneurisms. We wish that it was possible to soften this ringed appearance in the arteries, as it is a disfigurement to many otherwise beautiful plates. The use of the camera is to be commended for one thing, in that it preserves the relative proportions of the different structures far better than the pencil of the artist. Thus, many of Dr. Deaver's plates are calculated to give erroneous ideas of the size of the smaller arteries and nerves. In Plate 86 the radial artery is represented as larger than the brachial of a previous drawing, while the radial nerve is as large as

the median. This is a fault that is common to most of the drawings from Plates 79 to 92. It is not in the interests of accuracy in a work in which the structures ought to be drawn to scale to change the proportions so that the drawings are actually misleading. The radial nerve is by actual measurement depicted as a quarter of an inch in diameter; other small arteries and nerves being as much out of proportion in all of the plates mentioned. Clearness does not require such exaggerations. Dr. Deaver gives the reviewer little occasion to criticise his anatomy, although there are some statements which seem open to question. On page 352 he says that the spinal column has no lateral curvature, which is certainly not in accord with any text-books on anatomy with which the writer is acquainted. On page 584 it is stated that the course of the longitudinal sinus is represented by a straight line drawn from the root of the nose over the median line of the vertex to the external occipital protuberance. It is the experience of the reviewer that in most cases the sinus in the posterior part of its course would, particularly in the region of the protuberance, lie wholly to the right of this line. One can always approach closer to the median line from the left side in the occipital region than from the right. On page 360 there is a valuable table of landmarks prepared with reference to the spines of the vertebræ. The plates of the spinal cord and its membranes are most instructive and are finely executed; so, too, are the plates which describe the ligaments of the spinal column.

Plates 148, 149, and 150, which deal with the interior of the cranium and the superior surface of the brain, are extremely beautiful, and cannot fail to give a clear idea of the different structures depicted. We anticipate with pleasure the drawings of the brain itself which are to appear in the second volume.

There are some questions of surgery in the book on which most text-books and very many operators will differ from the author. On page 27 the warning is given that "too deep an incision may enter the tendon-sheaths or the great carpal bursa." These situations are precisely where we most frequently find pus in suppurations about the hand, and, unless the incision is made sufficiently deep to drain these

spaces, widespread destruction of function may ensue, not to speak of more serious consequences.

On page 248 it is stated that in subglenoid dislocations of the humerus the long tendon of the biceps is in many cases torn. This is doubtful. Indeed, Stimson in his classical work on "Fractures and Dislocations" says that the tendon of the long head of the biceps appears to habitually escape rupture.

On page 260, the writer states that bones are excised for malignant growths. We do not think that surgeons will approve of this statement. A malignant growth in one of the long bones will require a high amputation, and at the present time a surgeon who would venture to excise a bone which was the subject of malignant growth could be accused of a too limited acquaintance with pathology. In the same line, under the subject of excision of the clavicle, the advice is given to separate the periosteum from the bone and lift the bone out after severing the clavicular and sternal attachments. As the clavicle is excised, as a rule, but for one cause, sarcoma, this advice is distinctly bad, and would, if followed, render recurrence a certainty. Further on, under the head of fractures, it is stated that fractures of the humeral condyles are not very frequent. If the writer means compared with all fractures this may be true; nevertheless, it is undoubtedly also true that fracture of the condyles, one or both, is one of the most frequent injuries that can befall the humerus. The transfixion method is recommended for amputations at the elbow. This will not meet with universal approval. It is somewhat surprising in treating of amputations at the shoulder to find Dr. Deaver advocating ancient methods of controlling hæmorrhage, while omitting so important an improvement in hemostasis as the use of Wyeth's pins. In treating of aneurism, the author delivers himself as follows regarding the method of Antyllus: "This is not a good operation, because there is copious bleeding, the artery is tied where its coats are diseased, and secondary hæmorrhage is likely to occur." To this statement we may compare that made by Stimson in his article on the same subject which appeared in Dennis: "The operative method which has most recently received the stamp of approval, and has been

put forward as the method of choice, is the method of Antyllus." Many surgeons have gone further than this and advised and practised complete excision of the sac. It is by no means certain that this method, so recently revived, will take the place of the Hunterian operation; nevertheless, the fact that it has been revived and extensively practised by some of our best surgeons entitles it to more considerate mention. In speaking of inoperable aneurisms no mention is made of MacEwen's method of needling the sac, nor of the introduction of a large or small quantity of wire within the sac in connection with the use of a galvanic current. It is true that this work does not pretend to be a treatise on surgery, but if ancient methods of treating aneurisms are to be given a place, the more modern treatment should not be excluded. When speaking of the application of the ligature to an artery, the author again follows the older practice of applying sufficient force to rupture the inner coats. He thus ignores the work of Ballance and Edmunds, who showed not only that this was unnecessary, but that it was a distinct danger. With regard to the treatment of hæmorrhage from the palmar arch, the author clings to the old ideas, and advocates the use of compresses or a resort to ligation of the brachial artery, or the application of hemostats which are to be retained for a certain time. To take up the last point first, it seems evident that if the hemostats control the hæmorrhage, that a suture ligature about the tissues compressed would equally control it. The palmar arch is no less amenable to modern methods of hemostasis than any of the other anastomoses of the circulation, and the rule here is exactly what it is elsewhere, namely, to tie both ends of the bleeding vessel. What mystery is there about the palmar arch which should compel us to tie the brachial instead of applying ligatures directly to the bleeding points? We have absolute control of the hæmorrhage, and it is possible to locate the bleeding points as accurately here as elsewhere. The proposition to stay the hæmorrhage with compresses is most unsound. Such a method has two disadvantages, first, it is uncertain and liable to be followed by serious loss of blood in the surgeon's absence. Second, it invites sepsis, for it implies equally with the use of hemostats an open wound, together

with the increased danger of considerable pressure. It has no place in modern surgery. We are surprised to find it mentioned with approval. It is with some regret that we find it necessary to criticise more or less severely many of the surgical tenets laid down in this book. They were, no doubt, orthodox twenty years ago, but will not receive approval at the present day.

ALGERNON T. BRISTOW.

MECHANICS OF SURGERY. By CHARLES TRUAX. Chicago, 1899.
Pp. 1224. Charles Truax, publisher.

This volume, compiled and published by Mr. Charles Truax, an instrument maker of Chicago, enters a field seldom touched on by surgical writers. In his "Mechanics of Surgery," Mr. Truax has endeavored to supply an armamentarium which shall not merely picture and designate the various surgical implements, appliances, and furniture, but shall give a word of description to each. Expanding this idea, the instruments are grouped appropriate to the region for which they are adapted, lists of the tools required for each sort of operation are furnished, and directions appended for the preparation of surgical supplies, for the sterilization of dressings, and for the measurement and application of orthopædic appliances.

As the author points out, no mere catalogue of instruments is complete enough to furnish more than the name, price, and appearance of the maker's stock in trade, and is often faulty in these particulars; writers seldom speak of the mechanical part of the operations they describe other than in the most casual way; while uniformity of nomenclature is sadly lacking. All these things he tries to set right.

The rapid strides in operative surgery have caused more than corresponding increase in surgical tools: new masters of the art are constantly devising new forms, or remodelling old ones to suit their necessities or their whims; new methods have made obsolete many instruments once thought indispensable; from all of which it follows that a work intended to guide the beginner in his choice of tools, or to furnish the skilled surgeon an adequate source whence he may

draw ideas, must not be restricted by personal choice or the limits of territorial usage, but must be an encyclopædia sufficiently broad to contain all things for all men.

Mr. Truax, in narrowing the limits of his book to include only such instruments and methods as are in common use and recommended by selected authorities, has somewhat lessened its value, especially as many surgical antiquities are retained at the expense of modern tools of great value. We think, too, the descriptive text might have been in many places advantageously expanded.

While it will prove an aid in the identification of instruments, it must be supplemented by the illustrated lists of other standard makers. It is a step in the right direction.

HENRY GOODWIN WEBSTER.

THE NERVOUS SYSTEM AND ITS CONSTITUENT NEURONES. By LEWELLYS F. BARKER, M.B., Associate Professor of Anatomy in the Johns Hopkins University. 8vo, pp. 1122, 1899. New York: D. Appleton & Co.

This book represents the most advanced work that has ever been done in the anatomy and physiology of the nervous system. It is not as concise as some of the other allied works, and is possibly too deep to be used as a text-book by medical students, but it will be of much practical value to the more advanced workers who expect to devote special attention to the nervous architecture of the body.

Barker has taken advantage of the advance in the printer's art which has made it possible for him to reproduce many photomicrographs and lithographs of actual specimens, bringing out with exactness the details of nervous structures. This is of obvious value to the reader. The text is profusely illustrated, and every reference to morphological relations is carefully depicted by very superior drawings. The author makes a great point in this. The series of drawings of transverse and horizontal sections through the medulla, pons, and midbrain prepared by Mr. L. Schmidt are particularly noticeable for their excellence. Many of the illustrations have been borrowed from foreign sources. The printing at the side of many of the cuts of the

actual names of the objects illustrated instead of the old style of reference letters and figures is a feature of the book. The nomenclature is consistent throughout. The text is supplied with copious foot-notes giving in every instance the authority and exact references upon which the author bases his statements. Bibliography has been extensively explored, and Barker has brought together in one volume the results of the recent investigators and skilled artists of all countries. He has reviewed the chief achievements, but has not gone into old theories now abandoned.

The introductory chapters consist of the articles (revised and brought up to date) which were published by the author in the *New York Medical Journal*, beginning in 1897.

The whole book is based on the neurone concept. This is formulated by Barker in the following words: "The nervous system, aside from its neuroglia, ependymal cells, blood-vessels, and lymphatics, consists of an enormous number of individual elements or neurones. Each neurone in its entirety represents a single body-cell. These units are at first entirely (if protoplasmic bridges be excepted) and continue throughout life, relatively, to be morphologically and, in part, at least, physiologically independent of one another."

After discussing the development of the neurone concept the author takes up successively the External Morphology of Neurones, the Internal Morphology of Neurones, the Histogenetic Relations of the Neurones, the Neurone as the Unit in Physiological and Pathological Processes, and, lastly, on the Grouping and Chaining together of Neurones in a Complex Nervous System like that of man and mammals. The consideration of this last topic takes up at least two-thirds of the book, and is most thoroughly and systematically worked out.

The thoroughness with which the author has treated his subject, and the clearness which characterizes his statements, makes the book of value to every student of anatomy and physiology.

LEWIS S. PILCHER.

FURTHER OBSERVATIONS ON DEPRESSION OF
THE NECK OF THE FEMUR IN EARLY LIFE;
INCLUDING FRACTURE OF THE NECK OF
THE FEMUR, SEPARATION OF THE EPIPHYSIS
AND SIMPLE COXA VARA.¹

By ROYAL WHITMAN, M.D.,

OF NEW YORK.

IN 1890 I reported a case of fracture of the neck of the femur in a child.² Since then seventeen similar cases have come under my observation. In 1897 it was possible to confirm the diagnosis, which until that time had depended upon the physical signs, by Röntgen pictures, and during the present year the exact nature of the injury has been demonstrated by specimens.

Of the eighteen cases, eight were in males and ten in females.

Ages: between two and three years, 2; between three and six years, 7; between six and nine years, 7; sixteen years of age, 2; total, 18.

The nature of the accidents:

One fell from a window of the second floor of a house, one fell from a window of the third floor, two fell from a window of a fourth floor, one fell from a window of the sixth floor; one was run over; five fell from heights averaging fourteen feet; four fell down flights of stairs; one was injured in a game of football; in one case the history was indefinite.

¹ Read before the New York Surgical Society, November 8, 1899.

² Patient presented at a meeting of the Orthopædic Section of the New York Academy of Medicine, December 9, 1890. See report, *New York Medical Journal*, February 7, 1891.

The physical characteristics of fracture of the neck of the femur in childhood are as follows :

A child, previously in perfect health, after an accident of the nature indicated, presents an actual shortening of the limb of one-half to three-quarters of an inch. This shortening is explained by a corresponding elevation of the trochanter, which is usually abnormally prominent and is slightly displaced towards the anterior superior spine; there is also slight outward rotation of the leg. For several weeks or months after the injury there may be discomfort on manipulation, and muscular spasm may restrict motion; but when repair is completed, the range of motion is either unrestricted or but slightly limited in extreme abduction, flexion, and inward rotation; and a slight limp is the only symptom that is apparent.

My persistence in calling attention to fracture of the neck of the femur in childhood may be explained by the fact that until very recent years this injury was supposed to be confined to adult age; and even at the present time, in no text-book, is attention called to the peculiarities that distinguish it from the ordinary type.

Fracture of the neck of the femur in childhood does not usually entail the immediate helplessness and persistent disability that are associated with the injury. In many instances the patients are able to walk about within a few days after the accident. Thus it may be inferred that the separation of the fragments is usually incomplete, and that the fracture is rather a bending and breaking than a displacement or impaction.

Either because this injury is supposed to be confined to adult age, or because the immediate symptoms are slight, or because a physical examination is not made, a primary diagnosis is unusual; but the persistent limp, accompanied, it may be, by discomfort or pain during the stage of repair, is very often mistaken for hip-disease; a mistake to which I am indebted for the opportunity to examine the patients at the Orthopædic clinics with which I am connected.

Four patients were seen within the first month after the accident, seven were seen within two months, five within six

months, and two within one or more years after the injury had been received.

Besides the clinical peculiarities that have been mentioned, there is still another point of interest that entitles it to special notice.

This fracture in older subjects entails immediate and persistent disability from which gradual improvement may be predicted. In childhood the period of disability is short, and the immediate result is practically perfect functional recovery; but as the neck of the femur in its new position is subjected to greater strain, a gradual exaggeration of the depression, with its attendant symptoms of actual and apparent shortening, limp, and disability, is extremely probable.

Thus, the patient who has sustained a fracture of the neck of the femur is in the early stage of what is likely to be progressive coxa vara. The fact that simple depression of the neck of the femur in a healthy child predisposes very strongly to progressive deformity, as was proved by the examination of a number of patients several years after the injury, is of interest as throwing light on the etiology of simple coxa vara; and it is also of importance as an indication for treatment.

There is one other point of minor importance that may be mentioned in connection with this injury in childhood. Taking it for self-evident, that an elevation of the trochanter, and a corresponding shortening of the limb, without dislocation, can only be accounted for by a depression of the neck of the femur, the question remains as to the exact situation of the injury, whether it be in the neck or in the head of the bone at the epiphyseal line.

Elsewhere I have considered this question at some length. In brief, the points in favor of fracture of the neck in distinction to separation of the head are these:

Under the influence of sudden violence applied to the upper extremity of the femur, the injury is more likely to be of the smaller and weaker part, the neck, rather than at the larger and better protected epiphyseal junction.

This conclusion is borne out by the history and by the physical signs, for if the fracture were at the epiphyseal line,

thus involving the articular surface of the joint, and there were sufficient separation of the fragments to explain three-quarters of an inch of shortening, the function of the joint must be impaired by the irregularity, increased by callus formation during the stage of repair; whereas, in nearly all the cases that I have reported the function of the joint was practically perfect.

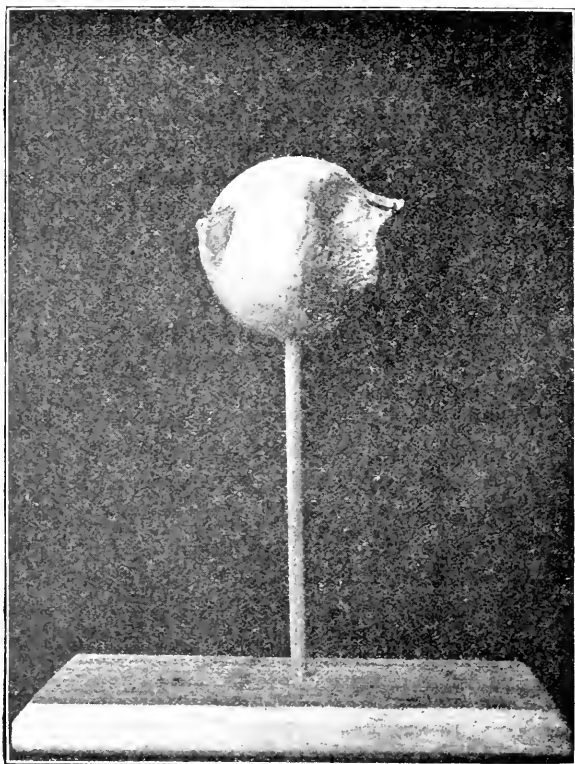


FIG. 1.—Fracture of the neck of the femur. Bolton's case. The fracture is of the middle of the neck, which in early childhood is less than an inch in length.

The Röntgen pictures show the depression to be of the neck as a whole rather than at the epiphyseal junction, except in one instance, to which attention will be called.

Anatomical proof, the only positive evidence, can hardly

be attained in the ordinary case; but this is now no longer lacking, as is demonstrated by accompanying photographs of a case seen with Dr. P. R. Bolton.¹ The patient, a boy of eight years of age, fell from the sixth story of a house and received

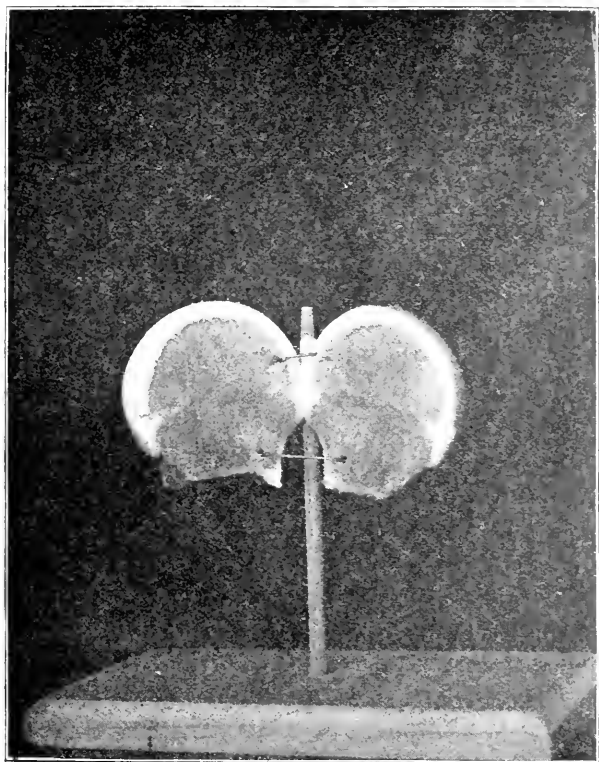


FIG. 2.—Section showing the epiphyseal cartilage.

a severe injury of the right hip. He was taken to Bellevue Hospital, where a diagnosis of fracture of the neck of the femur was made. Four weeks later, as there seemed to be no indication of repair, the distal fragment, consisting of the head and

¹ Two other anatomical specimens of fracture of the neck of the femur in young children, obtained at autopsy, were described at the last meeting of the American Orthopaedic Association,—one by Dr. T. H. Myers, of New York, the other by Dr. C. L. Starr, of Toronto.

nearly one-half of the neck of the bone, was removed by Dr. Bolton.

I mention the subject at this time because Sprengel, of Brunswick, has recently described two cases of epiphyseal separation in adolescents. (*Archiv für klinische Chirurgie*, Band xlvii, 1898, S. 805.)

CASE I.—A boy seventeen years of age was admitted to the hospital in April, 1897, walking with difficulty with the aid of a cane. The left leg was adducted and rotated outward. The trochanter was prominent and was above Nélaton's line. There was an actual shortening of two centimetres, and an apparent shortening of six centimetres. The range of flexion and abduction was much restricted. These symptoms were of three weeks' duration. The actual disability was of sudden onset, accompanied by pain in the hip, while the patient was walking. On close questioning he acknowledged that he had suffered discomfort in the hip that had obliged him to drag the leg for some time before. An excision was performed, and the specimen showed downward displacement of the epiphysis of the head, which was, however, firmly fixed to the neck. The patient left the hospital seven months later, walking with the aid of a cane.

CASE II.—A boy of eighteen years was admitted to the hospital in November, 1897. The physical signs were almost identical with those of the preceding case, except that the disability was of the right leg. The symptoms were of sudden onset, following a fall from the knee of another man to a stone floor. As in the first case, the patient had suffered previously from discomfort referred to the hip. The specimen obtained by excision resembled the first very closely. Seven months later the patient was discharged walking with two canes.

In his article, Sprengel refers at some length to the ten cases of fracture of the neck of the femur that I had reported, and concludes that these were in reality cases of separation of the epiphysis, on the following grounds:

(1) That he had demonstrated this accident in two cases, while I had presented no anatomical evidence.

(2) That it was an axiom that the epiphyseal line was a weak point in the bone, and therefore separation rather than fracture was to be inferred.

These arguments are of little weight, since the cases re-



FIG. 3 —Separation of the epiphyses of the head of the femur.

ported by Sprengel were in adolescents, in both of whom there was evidence of previous weakness in the part, as shown by discomfort and disability preceding the acute symptoms; while all of the ten cases reported by me were in children less than eight years of age, who were in perfect health up to the time of the accident.

The anatomical evidence of fracture is now supplied, and, finally, it may be stated that there is neither clinical nor experimental nor anatomical evidence to support the assertion that the epiphyseal junction is a weak point in the bone of a healthy child, in the sense that separation at that point is more common than fracture. If this junction is ever a weak point in this sense, it is not in childhood, but rather in adolescence, when the external cartilage and resistant covering of periosteum have diminished to nearly the adult condition. It is at this age and in the class of cases that Sprengel has described, that epiphyseal separation may be caused by a slight degree of violence. The following case, which has recently come under my observation, is an example:

A boy sixteen years of age, who had been under observation for suspected coxa vara of the right side, came again to the Hospital for Ruptured and Crippled on October 10, 1899.

Three weeks before, while playing football, his left thigh was violently abducted while he was in the sitting posture. After walking a short distance, the pain, discomfort, and weakness increased so that he required assistance in reaching his home. Since then he had been walking about more or less with the aid of a crutch, which he still used. Examination showed symptoms very similar to those of the preceding cases. There was slight flexion and outward rotation of the leg, one inch of shortening, and a corresponding elevation of the trochanter, which was not, however, especially prominent. Motion caused some discomfort and was accompanied by a clicking sound. This at first was thought to be due to movement of the fragments on one another, but it was probably caused by the slipping of the tissues over the trochanter. A short spica plaster bandage and a traction hip-splint relieved his symptoms and enabled him to walk about with ease (Fig. 4). The accompanying Röntgen picture shows typical epiphyseal separation.

In certain cases of coxa vara of the adolescent type, the point of greatest deformity, as shown in Röntgen pictures, may be at the epiphyseal line, and the first symptoms may follow slight injury or over-strain ; but it has seemed to me that these might be classed more properly as varieties of coxa vara than

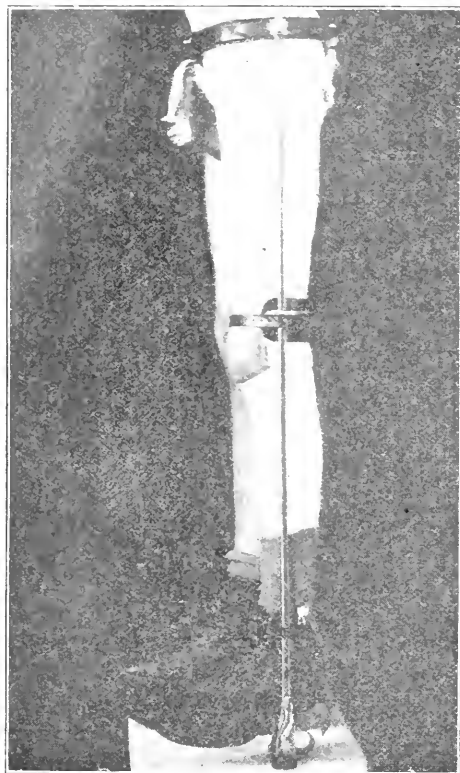


FIG. 4.—An effective treatment for fracture of the neck of the femur. A plaster spica bandage extending from the lower ribs to the knee, combined with a traction hip-splint.

of simple fracture or epiphyseal disjunction, because the primary symptoms were not disabling, and because the course of the affection did not differ from that of the ordinary type of this deformity. In such cases it may be inferred that the injury may have broken the cortical substance over the epiphyseal junc-

tion, and that the newly formed bone has gradually given way under use.

Coxa vara, of which fracture of the neck of the femur in childhood is, practically speaking, the traumatic form, is a deformity at the hip-joint, corresponding in its etiology and significance to genu valgum or varum. It differs from them in that, as the distortion is concealed from view, its diagnosis must depend, in the early stage at least, upon a proper interpretation of the symptoms. These symptoms, however, are caused directly by the deformity and by the weakness that accompany it. In most instances the depression of the neck of the femur is backward; thus there is an elevation and prominence of the trochanter, and a corresponding shortening of the limb which is rotated outward. Motion is somewhat limited in abduction, flexion, and inward rotation. If, as in rare instances, the neck is depressed in a forward direction, outward rotation and extension will be restricted in place of inward rotation and flexion. In all instances the limp is the most important symptom; with this there is often complaint of discomfort, particularly of stiffness, referred to the hip and thigh; and if the deformity is progressive, as in adolescence, these symptoms may be increased to actual acute pain, particularly after exertion or if aggravated by injury. The limp is, in quiescent cases, caused by actual shortening; but as the deformity progresses this is exaggerated by the upward tilting of the pelvis in compensation for the restricted range of abduction. It is of interest to note that tilting of the pelvis is often present before the range of abduction is greatly restricted by the actual deformity. This represents, doubtless, the instinctive adaptation to the new condition, the lessening of the strain upon the weakened part by adducting the limb. Bilateral coxa vara differs from the unilateral form only in its effects upon the gait and attitude.

Unilateral coxa vara, as well as fracture of the neck of the femur, is usually mistaken for disease of the hip-joint, although the distinction between the two is marked. In coxa vara the shortening of the limb, explained by the elevated and prominent trochanter, is present from the first, while in disease of the hip shortening is a late symptom.

In coxa vara the motion of the hip is restricted in certain directions and is unrestricted in others, while in hip disease motion is checked in all directions by muscular spasm, which in coxa vara is an unusual symptom.

I have elsewhere recently described the peculiarities of coxa vara, and it is hardly necessary in this connection to speak of the exceptional cases in which the diagnosis may be more difficult.

Since 1892, thirty cases of this affection have come under my observation. Of the thirty cases, twenty-two were in males, eight in females.

The deformity was unilateral in twenty-five (right, fifteen; left, ten), bilateral in five.

The neck of the femur was displaced downward and backward in twenty-seven, downward and forward in three.

The ages at which the symptoms first became noticeable appeared to be as follows:

Adolescents, 12-17	14
Later childhood, 5-11	10
Early childhood, less than 5	5
Unknown	1

The Etiology of Simple Coxa Vara.—In very many instances coxa vara may be explained by an acquired or an inherited predisposition to the deformity. The normal inclination of the neck of the femur protects it from strain; if for any cause this angle is diminished the strain upon the part is proportionately increased. This is proved by the fact that simple traumatic depression predisposes to further deformity long after the repair of the injury. Thus, one may assume that in many instances a slight depression is acquired in childhood as a result of rickets, of which there was a clear history in more than a third of the thirty cases, including all of the bilateral form. Such depression may remain latent, or, under favoring circumstances, it may become exaggerated to noticeable deformity. These favoring circumstances are more likely to occur during adolescence, when to the instability of rapid growth is added the

increase in the weight of the body, and in some instances the over-strain of laborious occupation.

In other instances there may be a congenital predisposition caused either by a lessened angle or by abnormal weakness of structure. In none of the cases in later childhood or adolescence has there been evidence of active or late rickets, and the presence of so-called local rickets, as accounting for the deformity, is at present unproved.

In a small percentage of the cases the early symptoms appear to have been induced or aggravated by over-strain or injury, but as a rule the symptoms appear insidiously and without assignable cause.

In childhood these symptoms are slight and are often remittent, and the progress of the deformity is slow, but in adolescence it is more rapid, the symptoms are more marked, and it may be, at times, disabling. When the resistance of the compressed bone checks the deformity the symptoms cease, and improvement in functional ability follows; but a well-marked limp always remains; the actual shortening is about an inch, but the upward tilting of the pelvis, due to the limitation of abduction, usually increases this considerably, and it may add greatly to the disability, especially if the affection is bilateral.

A more extended observation of depression of the neck of the femur has modified in some degree my opinion as to its treatment. Formerly, operative treatment seemed to be indicated simply for the correction of fixed adduction of the limb, and for this purpose linear osteotomy below the trochanter minor, which allows one to correct the outward rotation as well as the adduction, proved to be an effective treatment in two cases of the adolescent type. (The first operation was performed in 1894; the second in 1896.)

In the less advanced cases, apparatus to remove the strain, combined with exercises, was employed; but this treatment, although it was effective in relieving the symptoms, did not assure the patient from recurrence while the local predisposition remained. For this reason, a prophylactic operation for the purpose of replacing the neck of the femur at its former angle suggested itself. This was accomplished in six instances by

means of the removal of a sufficient wedge of bone from the base of the trochanter.

In four of the cases the depression was due to injury, in the two others it was simple coxa vara. All of the patients were children. A brief description of the cases may be of service in illustrating the clinical characteristics of the deformity.

CASE I.—*Traumatic Coxa Vara; Fracture of the Neck of the Femur.*—A girl three and a half years of age was first seen at the Vanderbilt clinic, September 21, 1895. Two weeks before, she had fallen down a flight of stairs, and since the accident she had limped, and had complained of discomfort about the right hip.

She presented the usual signs of traumatic depression of the neck of the femur, an elevated and prominent trochanter, outward rotation of the leg and half an inch of actual shortening.

One year later the shortening was three-quarters of an inch. Two years after the accident the shortening had increased to one inch, and the limp, increased by the progressive restriction of abduction of the limb, had become very noticeable.

The operation was performed at the Hospital for Ruptured and Crippled in August, 1897. A brace was worn for several months and then was discarded. At the present time, more than two years later, there is perfect functional ability, no limp or discomfort, and less than three-quarters of an inch of actual shortening.

CASE II.—*Simple Coxa Vara.*—A boy seven years of age was seen at the Hospital for Ruptured and Crippled in January, 1898. He was brought there by his parents because of a limp and discomfort about the right hip. The duration of the symptoms was two years. There was a clear history of infantile rhachitis, and slight bowing of the legs was evident.

On inspection, the physical signs were of coxa vara of the right femur, the shortening being but half an inch. The patient was kept under observation for six months, and, as the deformity was evidently progressive, the operation was performed at the hospital August 9, 1898. No apparatus was used in the after-treatment.

At the present time there is no discomfort, no limp or evidence of disability. The actual shortening is less than half an inch.

CASE III.—*Traumatic Coxa Vara.*—A girl nine years of age was brought to the Hospital for Ruptured and Crippled, July 16, 1898.

At the age of two years she had fallen (distance not noted). For two months after the accident she had refused to walk, since then she has limped somewhat, but within a few months the limp had increased and the child had complained of discomfort and pain. The examination showed typical coxa vara of a rather extreme degree. There

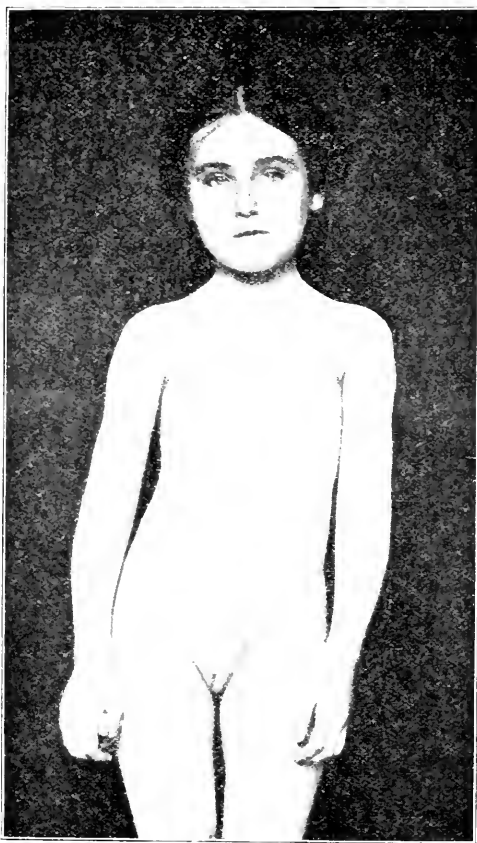


FIG. 5.—Case IV. Photograph of the patient, showing the effect of slight depression of the neck of the left femur upon the attitude.

was one inch of actual shortening, increased by an almost complete restriction of abduction.

The operation was performed in August, 1898, division of the adductors being required in order to allow the complete abduction of

the femur. As the family has left the city, the present condition is unknown. According to a friend, the patient was much improved by the operation.

CASE IV.—*Simple Coxa Vara in the Early Stage*.—A girl seven and a half years of age was seen at the hospital in June, 1899. She had for four months suffered somewhat from discomfort referred to the left hip, and there was a well-marked limp. The usual signs of coxa vara in the early stage were present. The shortening was half an inch. (Fig. 5.)

As there seemed to be a probability of progressive deformity, the preventive and corrective operation was performed on August 27, 1899. At the present time there is no limp, less than a half inch of shortening, and no discomfort.

A comparison of the Röntgen pictures will show the effect of the operation. (Figs. 6 and 7.)

CASE V.—*Traumatic Coxa Vara*.—The patient, a boy ten years of age, had been under observation for seven years. In 1892, when about three years of age, he had fallen from the fourth story, but apparently was not seriously injured. As a limp persisted after the accident, he was brought to the hospital one month later. He then presented the signs of typical fracture of the neck of the femur, with three-quarters of an inch of shortening. The application of a brace relieved the symptoms of discomfort and weakness, and on its removal the limp was very slight. An examination five years later showed that the shortening, due to further depression of the neck of the femur, had increased to one and a quarter inches. Two years later the actual shortening remained the same, but the practical shortening, caused by the restriction of abduction and to the compensatory tilting of the pelvis, was two inches, and the limp was, of course, very marked.

The operation was performed on September 10, 1899, the primary object being to overcome the restriction of abduction. The patient is now walking about, but the time is too short for an estimation of the functional result. (The improvement is very marked January 14, 1900.)

CASE VI.—*Traumatic Coxa Vara*.—A girl seven years of age was seen at the hospital in September, 1899. The previous year she had fallen down a flight of stairs. She was taken to a hospital, where she was treated, according to the mother's account, for a dislocation of the hip. After discharge from the hospital, she had continued to limp.

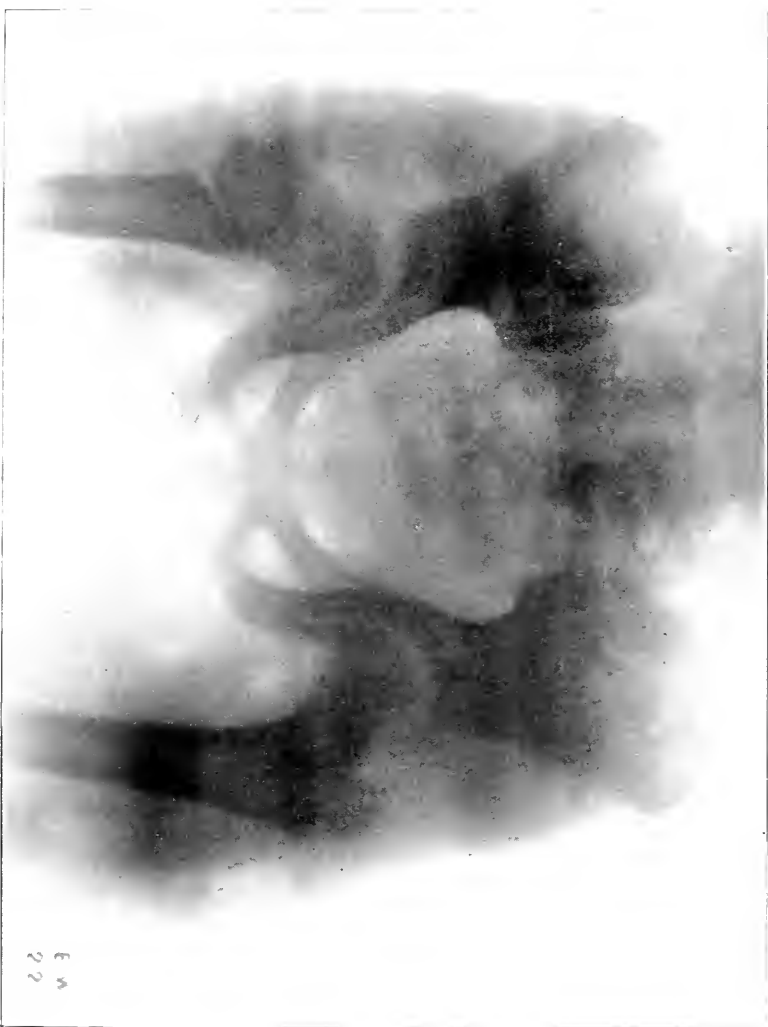


FIG. 7.—Case IV. Illustrates the effect of the operation in replacing the neck of the femur in its normal position.

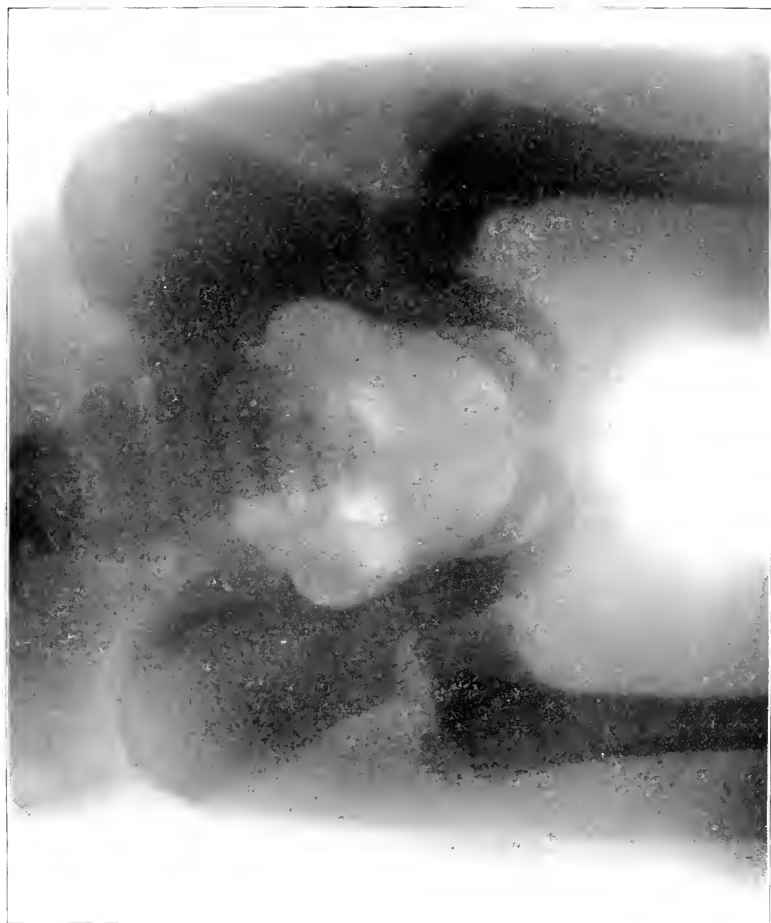


FIG. 6.—Case IV. Coxa vara of the left hip in the early stage.

In this case there was evident depression of the neck of the femur, resulting in one-third of an inch shortening.

The prophylactic operation of replacing the neck of the bone was performed on November 9.

This operation is, of course, more likely to be successful in childhood than in adolescence. In childhood the neck of the femur is short, and the strain to which it is likely to be subjected subsequently is slight; but in adolescence the part is longer and, as would appear from clinical histories, much less resistant; thus, in certain cases of this type, if the affection is well advanced, operative treatment should be deferred until the progression of deformity has ceased.

In the technique of this procedure there are several points of importance. First, all restriction of abduction, of ligamentous or muscular origin, must be overcome by vigorous manipulation before the operation on the bone, otherwise it will be difficult to bring the two fragments into proper apposition. The base of the wedge should be about three-quarters of an inch in breadth, directly opposite the trochanter minor; the upper section should be practically at a right angle with the shaft, the lower being more oblique. The cortical substance on the inner aspect of the bone should not be divided, but, reinforced by the cartilaginous trochanter minor, should serve as a hinge on which the shaft of the femur is gently forced outward until the opening is closed by the apposition of the fragments after the upper segment has been fixed by contact with the margin of the acetabulum; thus the continuity of the bone is preserved. The leg is then held in the attitude of extreme abduction by means of a plaster spica bandage, which should include the foot also, until the union is firm.

In regard to fracture of the neck of the femur, it is of course desirable to establish a diagnosis immediately after the injury, and the fact that this is so often overlooked emphasizes the importance of a **thorough** physical examination in all cases of accidents of this character. As far as the immediate symptoms are concerned, the results are doubtless as favorable after non-treatment as could be attained by the ordinary methods;

but, as I have suggested elsewhere, it might be possible to replace the neck to a certain degree at least by forcing the limb into extreme abduction and fixing it in that attitude by a plaster spica bandage or other appropriate apparatus. During the stage of consolidation the ordinary traction hip-splint is indicated, and I may again suggest that this appliance is useful in adult cases as well. Afterwards the patients should be kept under observation; and if the symptoms indicate that progressive

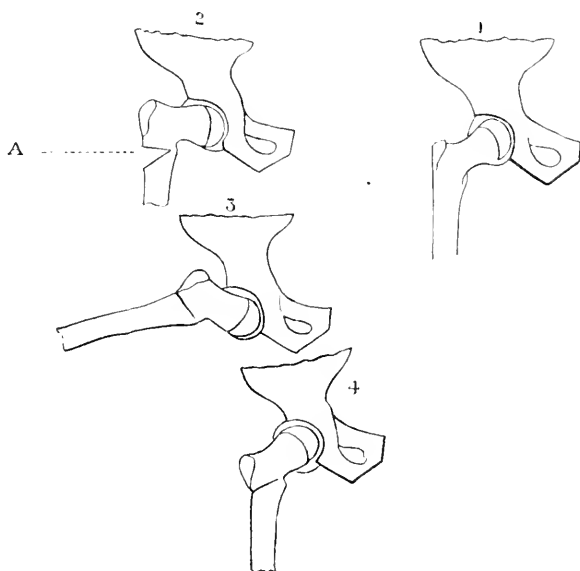


FIG. 8.—1. The normal femur. 2. Depression of the neck of the femur—coxa vara. A. A wedge of bone has been removed. 3. Abduction of the limb first fixes the upper segment by contact with the rim of its acetabulum, then closes the opening in the bone. 4. Replacement of the limb after union is completed elevates the neck to its former position.

deformity is probable, operative treatment, by means of cuneiform osteotomy, is advisable.

Excision of the hip has served a useful purpose in leading to the identification of coxa vara in adolescence, and in demonstrating displacement of the epiphysis, but it is hardly justifiable as a therapeutic procedure in either, at least from the stand-point of the functional result.

Of the forty-eight cases of depression of the neck of the femur, seventeen were simple primary fracture; one was undoubtedly separation of the epiphysis.

Of the remaining thirty cases, or more properly those of coxa vara, in four it seems probable that injury may have been the exciting cause of the symptoms; in two of these the deformity, as shown by Röntgen pictures, was most marked at the epiphyseal junction. In one other case an injury aggravated the symptoms of a pre-existing distortion.

In conclusion, I may state that the object of this paper, which is supplementary to other communications that I have made recently on this subject, is to place on record another case of separation of the epiphysis in adolescence, an accident that has been demonstrated by Sprengel, and to point out the essential difference between this class of cases and those of true fracture of the neck of the femur, of which anatomical evidence is now offered.

I may again call attention to the fact that depression of the neck of the femur, whether it be simple or traumatic, predisposes to progressive deformity. For this reason operative treatment may be indicated at an early stage of the affection as a preventive measure.

Finally,¹ the fact that forty-eight cases of depression of the neck of the femur have come under my observation within comparatively few years would seem to indicate that this deformity, from one cause or another, is more common than is generally believed.

(1) "Observations on Fracture of the Neck of the Femur in Childhood, with especial Reference to Treatment and Differential Diagnosis from Separation of the Epiphysis." (*Medical Record*, July 25, 1893.)

(2) "Further Observations on Fracture of the Neck of the Femur in Childhood, with especial Reference to its Diagnosis and to its More Remote Results." (*ANNALS OF SURGERY*, June, 1897.)

¹ Since this paper was written, five other cases have been seen,—two of fracture and three of simple coxa vara.

(3) "Observations on Bending of the Neck of the Femur in Adolescence, with Particular Reference to the Diagnosis and Significance of the Affection." (*New York Medical Journal*, June 23, 1894.)

(4) "Further Observations on Coxa Vara, with Particular Reference to its Etiology and Treatment." (*New York Medical Journal*, January 21, 1899.)

THE TECHNIQUE OF THE POSITIVE AND NEGATIVE DIAGNOSIS OF URETERAL AND RENAL CALCULI BY THE AID OF THE RÖNTGEN RAYS.

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ANY impairment of function in the kidney affects the whole system, and, although one kidney can perform the work of both, the partial or complete loss of one kidney affects the health, and renders the patient liable to the sudden perils of complete anuria. An early, accurate diagnosis is thus of the greatest importance, and yet the incompleteness of the symptom complex frequently makes a differential diagnosis impossible. The Röntgen-ray method, by detecting or absolutely excluding calculus, has rendered a great service. In all cases where a suspicion points to calculus, it can be confirmed or absolutely disproved.

Some time ago (*Philadelphia Medical Journal*, August 20, 1898) the author demonstrated the possibility of absolute accuracy in both the negative and positive diagnosis, and later (*Philadelphia Medical Journal*, April 11, 1899) showed the clinical value and necessity of such an accurate method.

This method was proved to have the following advantages: Mathematical accuracy, positiveness, and comprehensiveness. The early period at which the diagnosis is made, and the consequent early operation, decreases the mortality and prevents

partial destruction of the kidney. It avoids the dangers and pain attendant upon exploratory operations and gives a more definite diagnosis. The detail secured facilitates operation and insures its completeness. The examination of both kidneys and ureters localizes the operative interference, prevents operation on the wrong kidney, or unwitting operation on either, when both are the seat of calculous disease. Impacted or quiescent calculi in the pelvis of the kidney, its calices, or in the ureter, are detected, if only suspected. The absolute negative diagnosis renders rational a non-operative treatment, that would otherwise often endanger the life of the patient. It is especially in cases of anuria, either partial or complete, that the exact localization of the impacted calculus is of the utmost importance. If it remains, in partial anuria, the function of the affected kidney is destroyed, and so insidiously that it is impossible to distinguish destruction from recovery. Complete anuria is readily recognized, but the exact localization of the calculus and its immediate removal are essential to recovery.

The careful examination of the ureters as well as the kidneys is thus an essential of every complete Röntgen-ray diagnosis. The negative as well as the positive diagnosis can only be made by an operator who possesses a technique that permits him to show in the lumbar and pelvic regions shadows of tissues less dense than the least opaque calculus. One perfect negative, having this amount of detail, is sufficient for an absolute negative diagnosis. In order to eliminate defects in the emulsion on the plate, or those produced in developing, two or more plates showing the calculus in the same position are essential to the positive diagnosis.

The negatives are not always dense or easily read, as density is in some cases incompatible with the necessary detail. Experience and a skilled eye are needed in reading them as much as a technique in making them. This is the only source of error that involves the personal equation of the operator, *i.e.*, his ability to read correctly what the negative shows. All negatives should be studied with care under varying conditions, and should always be dry before a negative diagnosis is given, as the slight differential shadows can escape detection while

the plate is wet. Duplicate negatives should be made upon the same day, if there is any chance of the calculus moving; although later exposures showing the calculus in the same position prove that it is quiescent or impacted. As in all instances, of the localization of foreign bodies, operation should follow as soon as practicable, while all motion should be avoided in the interval.

The difficulties and errors that may present themselves if these precautions are not observed are illustrated by the following cases:

The examination of Mr. C. gave a negative diagnosis for the kidneys. The only pelvic picture taken appeared to show a calculus in the right ureter just outside the bladder. The negative was, however, defective, and a positive diagnosis could not be established by it, as, unfortunately, no duplicate had been made. Before the patient could come for a re-examination he had an attack of renal colic, and, as the subsequent plate failed to confirm the first, a negative diagnosis was rendered. He afterwards passed a calculus weighing nine-tenths of a grain, which conformed to the shadow in the first skiagraph. It undoubtedly passed into the prostatic urethra during the attack of colic, as a skilled surgeon failed to detect it, although the bladder was washed out with a Bigelow's evacuator. Had a duplicate skiagraph been made at first, it would have undoubtedly confirmed the diagnosis.

The case of Dr. F., of Chicago, also illustrates the value of examining the ureters. He was not satisfied with an X-ray examination which had been made of his kidneys, as his symptoms were acute and typical of calculous disease. He wrote, stating the circumstances and asking an opinion. As the sample of urine received showed crystals of oxalate of lime, besides other evidences pointing to calculus, it was probable that a calculus, if present, would be of that variety. Such a calculus would have been readily detected by any method, but the ureters had not been examined. The probability of a quiescent calculus in the ureter was suggested, and he decided to come on for examination. Before he could complete his arrangements for the trip, he passed a small cylindrical calculus, one-half inch in length, with symptoms that localized it in the lower ureter.

In the case of Mr. M., a series of negatives taken in duplicate, extending over six months, showed a minute calculus in the ureter just outside the bladder. It was undoubtedly impacted, but the age

and condition of the patient precluded operation. In one of the earlier plates the calculus had been present, but had not been detected, showing that the method was correct, but that its interpretation was inaccurate.

Another source of error is illustrated by the case of Mr. K. The negative had all the requisite differentiation in the pelvic and lumbar regions, but failed to cover the left kidney, extending only to the top of the third lumbar vertebra. The shadow of the kidney and calculus were thus cast above the plate. This error in diagnosis was due to faulty technique, the result of decreasing the number of exposures by an attempt to cover the entire region with one plate. It can be avoided by care in placing the plate.

In the case of Mr. N., a large and small calculus were found in the pelvis. It was found impossible to crush the larger calculus, which was removed through a perineal incision. The smaller one could not be found, though a finger was passed into the rectum and another into the bladder. Subsequent skiagraphs showed that the calculus was still there. Later experience leads me to believe it was in the ureter.

Mr. E. Stanmore Bishop (*Edinburgh Medical Journal*, July, 1899) has reported three successful operations upon ureteral calculi impacted in the lower ureter. In one case a large vesical calculus was removed, and later, during a delayed recovery, the ureteral calculus was detected and removed. The Röntgen rays had not been employed.

In cases where calculi are found by the Röntgen examination in the ureter, the presence of complete or partial obstruction can be determined by watching the urinary flow from that ureter with the cystoscope, and assists in forming a rational basis for treatment.

Bishop (*loc. cit.*) suggests suprapubic cystotomy as a direct extra-peritoneal route for attacking and removing these calculi, as the ureters low down, where the calculi frequently lodge, can be readily reached through the bladder wall. Where the cystoscope shows that the calculus projects into the bladder sufficiently, it can be grasped with the lithotrite, drawn out and crushed, an operation which has already been accomplished.

The following is the routine technique which has been developed and employed in the study of the appended series of

cases, which include only those examined since the negative, as well as positive diagnosis has been possible. All clothing containing opaque foreign bodies is removed from the area to be examined, and, if the breathing is markedly diaphragmatic in type when in the recumbent position, a binder is applied. The plate, protected from moisture and heat, is placed beneath the patient supported by a heavy board. The latest practice has been to employ a plate that extends from the last dorsal vertebra to below the pubic arch and sufficiently wide to cover both lumbar regions. Both kidneys and ureters are thus examined at the same time. The tube is placed in the median line above the third lumbar vertebra, and at such a height that its rays pass through the pelvis and cast a symmetrical shadow of the pelvic outlet on the plate below. A grounded screen of sheet aluminum or gold leaf on cardboard is always interposed between the tube and patient.

Skiagraphs are shadows, the varying densities of which correspond to structures each of which has a relatively constant resistance to the penetration of the Röntgen discharge. The more opaque shadows represent substances that absorb or disperse the most rays, the less opaque permit more rays to pass, while complete penetration is represented by complete absence of shadow.

Although all substances maintain constantly their relative opacity, this relative opacity varies in its shadow representation with the shortness or length of the exposure, and with varying qualities of Röntgen discharge, that in turn depend upon the varying state of the vacuum in the tube and on other physical phenomena present in their production.

The greatest value of the Röntgen ray in physical diagnosis is not in penetrating all tissues, but in producing differentiations between tissues that will lead to logical conclusions and absolute diagnosis. Thus, in examining for calculi, we do not want rays that will penetrate all tissues; we want a differentiation in the shadows that will demonstrate beyond a doubt that all calculi, no matter what their relative density, would cast shadows if present in the field examined. Such definition and differentiation make the negative diagnosis absolute. The

object, therefore, when examining for renal calculi by this method of diagnosis, is to obtain negatives in which the shadows are shown of tissues less opaque than the least opaque calculus. Where such definition is obtained, it is certain that not even the smallest calculus can escape detection, no matter what its composition is.

Experience has demonstrated the fact that tissue differentiation can be obtained by employing a Röntgen discharge from a tube having a low vacuum. The vacuum which is most suitable for these examinations is equivalent in resistance to one or one and a half inches of spark in air, as measured by the parallel spark gap on the coil. The wattage, or volume and voltage, of the secondary spark employed in overcoming this resistance has a direct bearing upon the volume of Röntgen discharge produced from the tube. The wattage of the secondary circuit must be high and the amount of discharge great, if rapid exposures are to be made. Such high efficiency is not required in the secondary circuit when higher vacua are employed, but then the penetration is too great, and all tissue differentiation is lost. The efficiency of an induction coil does not depend on the length of the spark, but upon the number of watts produced in the secondary circuit. It is this deficiency in wattage or in the amperage of a short spark that renders the static machine so inefficient where low vacuum tubes should be employed.

The self-regulating tube makes it easy to obtain and maintain the required vacuum that produces a Röntgen discharge which will differentiate between the softer tissues in the lumbar and pelvic regions. The vacuum employed is equivalent in resistance to a one and one-half or a two inch spark in air, as measured on the parallel spark gap on the coil. The secondary discharge of the coil must have a heavy wattage, a fat spark being an essential in producing a sufficient volume of low vacuum discharge to penetrate the lumbar or pelvic regions. Where such definition is obtained that tissues less dense than the least dense calculus are shown, evidently no calculus can escape detection. The length of the exposure depends entirely upon the efficiency of the coil in producing a heavy Röntgen

discharge from a low vacuum tube. In these cases it has been varied from five to fifteen minutes, with the individual resistance of the patient. The negatives are seldom dense, except in favorable subjects. They require study, and experience in other X-ray work is essential; but to the experienced eye each perfect negative furnishes absolute proof of the presence or absence of all calculi. A proof produced mechanically and free from the personal equation.

The appended series of cases upon which this paper is based have all been examined since the absoluteness of the negative, as well as the positive, diagnosis was established.

Fifty-nine cases here have been referred for examination in which the symptoms were either so marked as to simply need confirmation and the additional detail regarding numbers or position of the calculi, or where a differentiation from other conditions could not be made in any other way; or again, where a negative diagnosis needed confirmation. Under all these circumstances diagnosis has been found valuable and correct, while in some cases a positive diagnosis has been established where a negative was expected, or multiple calculi found where one was supposed to be present.

Calculi, single and multiple, were found in eight cases that were confirmed by operation. In one other case a small ureteral calculus was passed, and two other ureteral calculi were shown to be present by subsequent skiagraphs, where the age and condition of the patient did not permit operation. In one case the patient refused operation and left the hospital. In all of the seven cases of negative diagnosis subsequently operated on by nephrotomy, nephrectomy, or nephrorrhaphy the correctness of the diagnosis was confirmed with the exception of one case, already mentioned, where the error was due to faulty technique. Of the 59 cases examined, twelve were found to be the subjects of calculous disease.

There follows a chronological summary of the cases examined, with a brief *résumé* of their interesting features.

CASE I.—March 15, 1898. Mr. C. S. W., referred by Dr. Edward Martin. His symptoms were sufficiently pronounced to lead to a diag-

nosis of calculus. This diagnosis was confirmed by the skiagraph (Fig. 1), with the additional detail that two calculi were present, and giving their position. This facilitated their removal, as the smaller calculus was encysted, and was only found by measurements derived from the skiagraph. They were uric acid calculi, weighing thirty-two grains and ten grains.

CASE II.—March 22, 1898. Mr. P., referred by Dr. James Tyson. The symptoms of lumbar pain and the persistence of albumen in the urine, together with other symptoms, lead to a suspicion of calculus. The skiagraph, however, showed the absence of calculi.

CASE III.—March 22, 1898. Miss G., referred by Dr. Edward Martin. She had some blood and albumen in the urine, which could be accounted for by the movable kidney. The subsequent nephrorrhaphy confirmed, so far as palpation and needling could, the negative diagnosis furnished by the skiagraph, while the operation relieved the patient of all symptoms.

CASE IV.—April 5, 1898. Mr. C. S., referred by Dr. J. William White. The patient had pain in the lumbar region, shooting down into the groin. He had never passed calculi. The urine showed blood, pus, and albumen. The negative diagnosis was confirmed by a subsequent nephrotomy, which disclosed a tubercular kidney.

CASE V.—April 18, 1898. Mrs. S., referred by Dr. J. William White. She had a renal tumor with urinary symptoms that suggested the presence of a calculus. None, however, was found by the skiagraphic examination.

CASE VI.—May 17, 1898. Mr. H. A. L., referred by Dr. J. William White. Had had attacks of renal colic at frequent intervals, and had passed previously a small mulberry calculus. Two months ago the passage of gravel ceased, and the paroxysms of pain increased in frequency and intensity. Urine was acid; sp. gr. 1032. No blood, no pus, heavy deposits of uric acid gravel. The skiagraph showed the presence of a calculus, which was found encysted in the superior calyx and was covered with urates. It weighed twenty-one grains.

CASE VII.—May 23, 1898. Mrs. D. Dr. C. L. Leonard. In this patient the presence of a movable kidney was readily detected. The kidney was tender, and, as calculi are sometimes present in these kidneys, examination was advised. No calculus was found.

CASE VIII.—Mrs. A. K. D., referred by Dr. J. William White. In this patient calculi were present in both kidneys. The right kidney was operated upon and the calculus removed. The patient recovered from the operation, but the kidney was too nearly disor-

ganized to maintain its function. The post-mortem examination showed the skiagraphic diagnosis to be correct, and that the three calculi in the left kidney had destroyed it totally, although no symptoms had ever been referred to that side or that kidney. The calculus removed weighed four drachms, ten grains.

CASE IX.—November 3, 1898. Mr. P., referred by Dr. J. William White. The patient had for some time had marked hæmaturia, with an increase on motion and symptoms that simulated in a degree calculus. The skiagraphic examination showed us calculus to be present.

CASE X.—November 3, 1898. Mr. S. S., referred by Dr. Edward Martin. Though having symptoms that suggested calculus, the skiagraph confirmed the previous negative diagnosis.

CASE XI.—November 19, 1898. Mr. C. S., referred by Drs. Mitchell and Martin. This patient had had marked but indefinite symptoms of renal calculus, extending over a period of twelve years. Although examined on numerous occasions by prominent surgeons, the diagnosis had never been established, while exploratory nephrotomy had only been once suggested. The symptoms at this time were more marked, but were still indefinite. The skiagraphs showed a large hydronephrotic kidney, with one large and two small calculi. Every detail was subsequently confirmed by the operation. The kidney was sacculated and enlarged, and the three calculi were removed. The patient recovered completely. In this case, as in others where multiple calculi were shown, the value of such detail was demonstrated in making the operation complete.

CASE XII.—November 29, 1898. Mr. J. H., referred by Dr. James Tyson. He has had indefinite lumbar pain for six years; has had slight traces of blood in urine, but had never passed a calculus. The only symptoms were lumbar pain, a trace of pus, and some albumen. The skiagraphs showed a small calculus. Dr. White performed an exploratory nephrotomy, but was unable to palpate the calculus or touch it with a needle in the apparently healthy kidney. The incision into the kidney disclosed the correctness of the diagnosis, as an oxalate calculus was removed that weighed twelve grains.

CASE XIII.—December 1, 1898. Mrs. C., referred by Dr. Sharp. She had an indefinite pain in the lumbar region that had recurred in crises at various intervals, and had some of the characteristics of nephritic colic, when taken in conjunction with the pus and albumen in the urine. The suspicion was not confirmed by the skiagraph, as no calculus was found.

CASE XIV.—December 2, 1898. Mr. Charles B., referred by Dr

J. William White. This patient was sent for the confirmation of a negative diagnosis, as his symptoms were sufficiently obscure to make it seem necessary. No calculus was found.

CASE XV.—December 3, 1898. Mr. W., referred by Dr. Edmund W. Holmes. He had several attacks of pain simulating renal colic, with the presence of hæmorrhage, but no pus or casts. No calculus was found to be present.

CASE XVI.—December 6, 1868. Mr. G. F., referred by Dr. Edward Martin. This patient had but a slight amount of pain with no crises. There was a slight amount of pus and albumen. The negative diagnosis was confirmed by the skiagraph.

CASE XVII.—December 6, 1898. Mr. W. W., referred by Dr. J. William White. He had had frequent attacks of acute pain in the lumbar region, but not characteristic of renal colic. Just before the examination he had had pain with chill and sweating, with a lingering pain through back and limbs. The urine was normal in odor and color, no albumen, no sugar, acid in reaction, the microscope showed a few pus-cells, occasional red cells, some epithelium, but no casts. The skiagraph showed the presence of a calculus, which was removed by operation and weighed seventeen grains. It was composed of phosphates and oxalates.

CASE XVIII.—December 15, 1898. H. S., referred by Dr. J. William White. He had had repeated attacks of colic of moderate degree. There was blood and pus in the urine, but the attacks were far apart. The skiagraph showed the presence of a calculus, but this was not confirmed, as the patient refused operation.

CASE XIX.—January 20, 1899. Mrs. M. L., referred by Dr. G. E. Shoemaker. This patient had symptoms that suggested calculus, with recurring attacks of lumbar pain, though no true colic, followed by increased amounts of pus in the urine. The skiagraph showed the absence of calculi.

CASE XX.—January 24, 1899. Mr. S., referred by Dr. H. C. Wood. The symptoms in the case were indefinite, though simulating calculous nephritis. There was marked oxaluria and slight albuminuria, but no hæmaturia or pus. The skiagraphic diagnosis was negative. The symptoms were entirely relieved by subsequent medical treatment.

CASE XXI.—January 26, 1899. Miss P., referred by Dr. S. W. Morton. This young lady was anæmic, and had suffered for a considerable time from lumbar pain, which, however, was not characteristic, though the symptoms were in general such that a negative

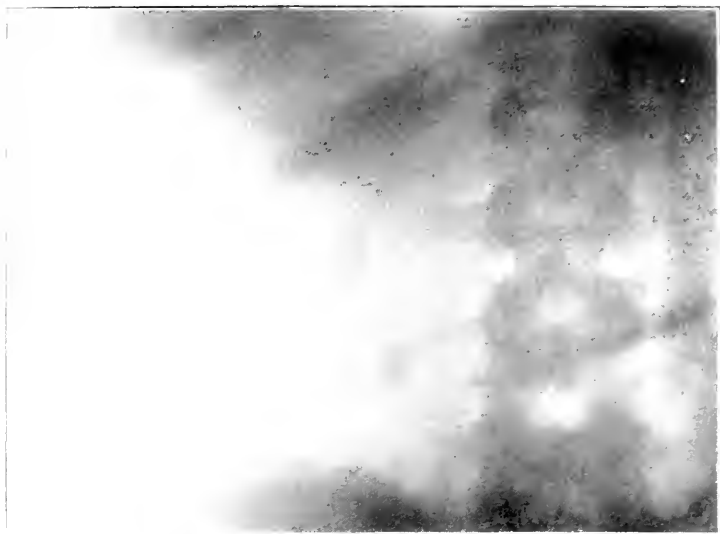


FIG. 1.—Dr. Edward Martin's case of renal calculi.



FIG. 2 —Dr. W. W. Keen's case of renal calculus.

diagnosis needed confirmation. This confirmation was secured by the skiagraphic examination.¹

CASE XXII.—February 19, 1899. W. A. D., referred by Dr. James Tyson. This patient had had a series of acute attacks that seemed to point to a calculus in the right ureter, where a distinct point of tenderness was found. The urine also pointed to the possibility of calculus, but the case had to be differentiated from appendicitis of a mild type. The skiagraph showed that calculi could be excluded.

CASE XXIII.—March 6, 1899. Mr. W. M., referred by Dr. J. William White. The symptoms in this case pointed to chronic cystitis. The absence of calculous disease was proved by the skiagraph.

CASE XXIV.—March 7, 1899. Mr. A. D. C., referred by Dr. W. W. Keen. The patient's symptoms were sufficiently typical to make the diagnosis of calculous disease probable. The skiagraphs made it positive (Fig. 2). The oxalic acid calculus was subsequently removed and weighed forty-eight grains.

CASE XXV.—April 5, 1899. Dr. T. E. P. He had had during the previous six or eight years a succession of attacks of nephralgic pain, which, however, were atypical and had never been very severe. The pain had finally become nearly constant, of a dull character, with acute exacerbations. No calculi could be found and the negative diagnosis was established.

CASE XXVI.—April 6, 1899. Mr. M., referred by Dr. J. William White. He had a persistent cystitis, with symptoms that made calculous nephritis a possibility. This made the absolute negative diagnosis afforded by the skiagraph essential.

CASE XXVII.—April 15, 1899. Miss S., referred by Dr. A. J. Downes. The patient had a slight hæmaturia, with a trace of pus. A cystoscopic examination and divided urines showed the trouble to be unilateral, and possibly tubercular, though this could not be confirmed by the bacteriological test. The skiagraph showed the absence of calculi. A subsequent nephrectomy confirmed the negative diagnosis.

CASE XXVIII.—April 24, 1899. Mrs. T. L., referred by Dr. H. L. Williams. She had had pain in the left lumbar region for many

¹ This case was subsequently operated upon by Dr. John K. Deaver. A valvular condition was present in the ureter, producing a hydronephrosis. The pelvis of the kidney was opened, but no calculus was present. This negative diagnosis is the seventh confirmed by operation.

years, with acute attacks that were so severe as to cause the birth of her last child at the seventh month. At first the pain recurred once in two months, but for the past year had been more frequent, while there had been a constant dull pain in that region. The urine, however, did not confirm a diagnosis of calculus, while the skiagraph showed no calculi to be present.

CASE XXIX.—April 25, 1899. Mr. I. P., referred by Dr. J. William White. This patient had suffered for twenty months with lumbar pain, and had had crises that simulated renal colic. The urine showed microscopic quantities of blood. The skiagraph showed the absence of all calculi.

CASE XXX.—April 25, 1899. Mrs. B., referred by Dr. J. Bryan. She had had frequent attacks of pain in the right lumbar region. The kidney was slightly movable, but the urine showed no indication of calculus. The skiagraph gave a negative diagnosis, which was confirmed at a subsequent nephrorrhaphy by palpation and needling. The operation relieved her of all symptoms.

CASE XXXI.—April 26, 1899. Mr. G., referred by Dr. S. S. Cohen. The examination confirmed a previous negative diagnosis, though the patient's symptoms suggested the possibility of calculous disease.

CASE XXXII.—April 27, 1899. Dr. H. H. S. Seventeen months previously he had had an attack with suppression of the urine. He had never passed crystals or calculi, nor had he had actual attacks of renal colic. He had pricking sensations on jarring, as by a false step. The pain is a dull ache, sometimes severe, especially before a storm. Albumen was present in the urine, but no blood or pus. The diagnosis was negative.

CASE XXXIII.—April 28, 1899. Mr. D. R. H., referred by Dr. J. William White. Twelve years previously had had attacks that were called renal colic, radiating down into the groin and lasting for three or four hours, and only relieved by morphia. Of late, these attacks have been less severe, but he has a dull ache in the old spot. Marked cystitis is present. The negative diagnosis was confirmed by the skiagraph.

CASE XXXIV.—April 28, 1899. Mr. K., referred by Dr. Steinbach. The patient had indefinite symptoms that suggested calculus. The skiagraph, however, demonstrated their absence.

CASE XXXV.—May 3, 1899. Mr. A. B. D., referred by Dr. Samuel Holman, of Pittsburg. This patient had persistent lumbar pain, which became very severe at times, though there was no actual

renal colic. The severity of the pain would be suddenly relieved, and a copious discharge of pus would be found in the urine, which then gradually diminished till renewed after another attack. The urine showed pus, some red blood-corpuscles, a slight amount of albumen, no casts, and occasional oxalate crystals. No tubercle bacilli had been found on repeated tests. Calculous disease was excluded by the skiagraphic examination.

CASE XXXVI.—May 4, 1899. Mrs. T., referred by Dr. J. William White. The symptoms which simulated calculous disease were shown by the examination to be dependent on other causes, probably the result of the cystitis, which was marked.

CASE XXXVII.—May 10, 1899. Miss E. A. F., referred by Dr. H. B. Allyn. She had suffered from lumbar pain of an indefinite character, with crises that simulated renal colic, but were not intense. The urinary symptoms did not confirm the diagnosis of renal calculus, and the skiagraph gave a negative result.

CASE XXXVIII.—May 14, 1899. Mrs. C. S. F., referred by Dr. C. Foltz. This patient presented many symptoms that simulated calculous nephritis, but they were not sufficient to establish a diagnosis. The cystoscope showed the orifice of the left ureter to be inflamed. There had been a previous cystitis that yielded to treatment in a measure, but pain persisted on micturition. Although the bacteriological tests were not positive, it seemed probable that the case was one of tubercular type, as no calculi were present. The subsequent development of the case showed it to be of tubercular character.

CASE XXXIX.—May 23, 1899. Miss G., referred by Dr. B. C. Hirst. She had had lumbar pain that simulated calculous disease in type, but was not so severe. The urinary analysis showed pus and albumen, but there was no other evidence that would suggest calculus. The examination showed that no calculus was present.

CASE XL.—May 23, 1899. Mrs. M., referred by Dr. Edward Martin. Although the symptoms were not typical of stone in this case, they were sufficiently suggestive to make the negative diagnosis obtained from the skiagraph very valuable.

CASE XLI.—May 23, 1899. Mrs. W., referred by Dr. D. B. Birney. The urinary analysis in this case, combined with the persistent symptoms of localized pain and tenderness in the right lumbar region, made the exclusion of calculus necessary. The skiagraph showed the absolute absence of calculi in that region.

CASE XLII.—May 26, 1899. Dr. H. A. W. The symptoms which brought this patient for examination had existed for some years,

but, although they seemed to indicate the presence of a calculus, they had never been sufficiently characteristic to permit any of the surgeons consulted to advise operation. The examination demonstrated the absence of calculi in the kidney. This diagnosis was confirmed by a Röntgen-ray examination made by an expert in London some weeks later.

CASE XLIII.—May 29, 1899. Mrs. D., referred by Dr. H. A. Beyea. The negative diagnosis was confirmed by the skiagraphic examination, although the symptoms were sufficiently characteristic to make the exclusion of calculus necessary and valuable.

CASE XLIV.—May 29, 1899. S. T. S., referred by Dr. J. William White. This patient had indefinite symptoms that were chiefly those of chronic cystitis. There was, however, considerable lumbar pain, which made calculous disease of the kidney possible. The examination of the kidneys showed them to be free from calculi, but a small, partially encysted calculus was found in the bladder and removed.

CASE XLV.—May 30, 1899. Mr. J. C., referred by Dr. J. H. Lloyd. This patient had had frequent attacks of renal pain that simulated colic. There was no pus in the urine, but blood in varying quantities with uric acid. As previously mentioned, the first examination showed the kidneys to be free from calculi, while the right ureter presented the indefinite shadow of a small calculus. The second plate of the pelvis, made after an intervening attack of colic, failed to show a calculus at that point, and a negative diagnosis was rendered. The patient subsequently passed, *per urethram*, a uric acid calculus weighing nine-tenths of a grain. It corresponded in bulk with the shadow in the first pelvic negative, and had probably been passed during the subsequent colic, and had thus escaped detection and the confirmation that made a positive diagnosis. It undoubtedly was not present in the ureter when the negative diagnosis was made.

CASE XLVI.—June 13, 1899. Mr. N. C. M., referred by Dr. Mitchell. He had had for some time a slight disturbance and some pain, but no true renal colic, on the right side. An examination some months previously had shown that the kidneys were free from calculi. A re-examination confirmed this negative diagnosis, but a further examination showed a small calculus in the right ureter just outside the bladder. Multiple skiagraphs demonstrated the accuracy of the observation and showed its position to be as stated above. A subsequent examination on October 27 showed that it had maintained its position. In the negative the outline of the bladder can be clearly made out, and the calculus is just outside of it.

CASE XLVII.—September 21, 1899. E. S., referred by Dr. Edward Martin. This patient had passed four calculi. The last was eighteen months previous to the examination. During the previous attack he had had lancinating pain. The urine had been dark, but no blood had been passed. Large quantities of uric acid crystals were always present. There has been an intermittent pain in the right kidney for some time past, but no true colic. The examination of the kidneys and pelvis yielded a negative diagnosis. Some uric acid gravel was subsequently passed.

CASE XLVIII.—October 3, 1899. G. L., referred by Dr. J. William White. This patient had had several severe attacks that were not typical in character, but pointed to either biliary or renal lithiasis. The urinary analysis showed nothing that would indicate the presence of a renal calculus, and the skiagraph confirmed a negative diagnosis.

CASE XLIX.—October 9, 1899. G. B. W., referred by Dr. Edward Martin. Persistent lumbar pain, which had existed for years, together with indefinite symptoms of renal disease, led to an examination of the kidneys, although the marked cystitis present sufficiently accounted for the present condition. The skiagraph excluded calculus.

CASE L.—October 12, 1899. H. S. H., referred by Dr. J. M. Barton. This patient had had recurring attacks of colic for four or five years, and had passed calculi on two occasions, the last having been passed in August. There were present in the urine a trace of pus, albumen, and a few red corpuscles, with oxalic and uric acid crystals. The pain was not severe, nor were there characteristic crises of colic. There were no calculi present.

CASE LI.—October 13, 1899. C. S., referred by Dr. D. D. Stewart. The patient had suffered from lumbar pain for some time past. He had, however, no typical attacks of colic, nor had he ever passed calculi. The urinary analysis was such that calculus was strongly suggested. Microscopic quantities of blood and pus were present. The skiagraph showed that no calculi were present. The symptoms were, however, sufficient to justify operation. Dr. W. W. Keen explored the kidney on January 18, but found no calculus. There were numerous adhesions.

CASE LII.—October 24, 1899. B. F. W., referred by Dr. D. M. McMasters. Eighteen months ago this patient had intense pain that was like renal colic, but yielded rapidly to a small hypodermic of morphine. Calculi have never been passed, and the urine has always been normal in character. Slight jaundice was noted after the earlier

attacks, where the pain was located on the right side. It has been absent in the later ones, which were less intense and intermittent, and in which the pain was indefinitely located in the left lumbar region. The last attack had persisted with varying intensity for the past ten days, and was always worse in the daytime. The examination showed the shadows of the kidneys, but no calculus was found in them or in the ureters.

CASE LIII.—October 24, 1899. J. J. M., referred by Dr. A. J. Downes. This patient had passed calculi on three occasions. The last was passed five years ago, since which time he had been free from symptoms until nine months ago, when an abscess formed in the lumbar region and was opened. The patient was, however, so weak that a more serious operation was not advisable. The sinus was reopened three months ago, but the physical condition still contraindicated extensive exploration. The urine has contained a slight trace of pus from time to time, and some red blood-corpuscles. The skiagraph showed a large calculus in the left lumbar region opposite the intervertebral cartilage of the second and third lumbar vertebra. At the subsequent nephrolithotomy it was found that the shadow of the calculus had been cast by a mass of amorphous urates and phosphates contained in a crystalline shell that filled the pelvis of the kidney. This mass broke up readily under the finger, and contained minute uric acid calculi. The detection of a calculus of such character leaves no doubt of the accuracy and efficiency of this method, and its value in negative diagnoses.

CASE LIV.—November 14, 1899. Mr. C., referred by Dr. J. C. Da Costa. He had had yellow fever, followed by tropical malaria a year ago. His attack of acute pain in lumbar region began five weeks before the examination. The urinary analysis showed nothing except an increased amount just previous to an attack. The attacks have decreased in severity. Phosphatic crystals are seen in urine that has stood for some time. A series of negatives demonstrated the absence of all urinary calculi.

CASE LV.—November 16, 1899. Mr. H. B., referred by Dr. H. D. Jump. This patient had lumbar pain and symptoms that might have been due to calculus, but they were masked by a cystitis. The skiagraphic examination showed the absence of calculi.

CASE LVI.—November 18, 1899. F. M., referred by Dr. J. William White. The urinary analysis in this case showed pus in microscopic quantities, which increased later. Urine was acid. Specific gravity was 1075. There was no blood. The attacks were paroxysmal

and intermittent in character, with no pain radiating into the testicle. The albumen was one-fourth by bulk. An enlarged kidney tumor could be recognized by percussion and in the skiagraph, but no calculus was present. A nephrotomy was performed on November 22. A hydronephrotic condition was found, but no calculi; numerous pockets of pus were opened. The negative diagnosis was confirmed.

CASE LVII.—November 25, 1899. F. W., referred by Dr. Alfred Stengel. The symptoms were atypical, and calculus was only suspected. The examination served to confirm the negative diagnosis.

CASE LVIII.—December 12, 1899. A. L. T., referred by Dr. A. J. Downes. The symptoms in this case were indefinite in character. The patient was stout and physical examination difficult. The skiagraphs showed the outline of the kidney, but no calculus was present.

CASE LIX.—December 12, 1899. Referred by Dr. D. D. Stewart. This patient had had attacks of pain following exertion, with a constant microscopic amount of blood and pus in the urine. The urine was acid and contained oxalate crystals. There was gastric disturbance in addition. This is the case mentioned above in which the plate failed to cover the left renal region, so that the shadow of the calculus was projected outside of it. It is the only case in which the negative diagnosis has been found in error. It was due to faulty technique and not to any defect in the method *per se*. A calculus (oxalate) was removed by Dr. W. W. Keen on January 6, 1899, twelve millimetres in length.

INTESTINAL OBSTRUCTION DUE TO INTUSSUSCEPTION.¹

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In a paper entitled "Intestinal Obstruction due to Intussusception and Volvulus," read by the writer before the New York State Medical Association, October 19, 1898, attention was called to an assertion made by Dr. Edwin Martin before the Philadelphia Pædiatric Society, November 9, 1897, which was as follows: "That he was particularly impressed with the rarity of intussusception, as out of 800 personal communications sent out by him, most of them being answered, the returns brought him records of but fifty-four cases, and that men of the widest experience in surgery, medicine, and pædiatrics reported that they had never seen a case." The author of this paper called attention to the statement of Dr. Martin by saying that "such a statement is apt not only to be misleading with reference to the frequency of the disease, but also has a tendency to create an undesirable impression of diagnostic acumen upon the profession at large."

In the paper read before the State Medical Association we cited twelve cases coming under our observation within a few years, eight of which were under the author's own care, the four remaining having been seen with other surgeons. Since publishing the above paper it has been the author's fortune to see two more cases, both of which were operated upon by him, one with success, and the other, which will be considered later, terminated fatally. In the first paper, after citing the twelve

¹ Read before the New York Surgical Society, October 25, 1899.

cases, we remarked that "such a series of cases under the observation of a single operator tends to the belief that the disease is much more frequent than most authors admit." With the two occurring in my practice during the summer months, we cannot but emphasize the foregoing remark, or rather say that the cases are much more frequent than heretofore supposed.

In fully 30 per cent. of all cases of acute obstruction we find intussusception as the cause, and fully 50 per cent. of all cases of intussusception occur in children under ten years of age; again, of these fully 50 per cent. occur under the age of twelve months. The percentage of cases diminishes pronouncedly between the ages of five and forty to fifty years, while after forty to fifty years there is again a noted increase. It has been suggested that the frequency of occurrence in infancy and after the age of fifty years is due to the powers of resistance being far less in extreme youth and old age.

Anatomically we may make the following classification :

(a) Those cases in which the ileo-cæcal valve forms the apex of the intussusception, as *ileo-cæcal*.

(b) Those cases in which the ileum and cæcum pass up into the colon, as *ileo-colic*.

(c) Those cases in which the intussusception is made entirely of small intestines, as *ileal* or *enteric*.

This latter variety has been and is now considered the most frequent, although in a series of seven cases operated upon by the writer four were ileo-colic, one was of the ileo-cæcal, and two were of the enteric varieties.

The enteric variety is most frequently found upon autopsy, but these cases are usually of post-mortem origin.

It would seem to the author that all cases might be classified according to the intensity of the symptoms and the time of fatal termination into

Acute, or those dying within seven days.

Subacute, or those dying between one and four weeks.

Chronic, or those dying after a month or more has gone by, rather than the following classification of Raffinesque :

Ultra-acute, when death occurs in twenty-four hours.

Acute, when death occurs after twenty-four hours and within seven days.

Subacute, when death occurs between the seventh and fourteenth days.

Chronic, when the condition exists from three weeks to months before a fatal termination.

Intussusception is produced by an irregular peristalsis. Among the chief causative factors of intussusception are :

(a) Former conditions of health,—*i.e.*, preceding physical conditions which have a tendency to reduce the power of resistance well below par, particularly well marked in children suffering from diarrhœa. Under this heading it is stated that a child of robust physique is not so prone to suffer this condition as one of a puny and delicate type. We cannot agree with this, as the majority of our cases were in well-nourished and robust children.

(b) Those of a pathological nature ; tumors, those usually involving the internal coats of the intestines ; polypi, and endotheliomata ; also Meckel's diverticula, as shown in the case reported by the writer in the *New York Medical Journal* of April, 1898.

(c) Causes which may be assigned under the head of anatomical. Of these we have long and lax mesentery or mesocolon, although this could not be demonstrated in any of the operation cases seen by the writer. The musculature of the intestinal wall has recently received considerable attention. The longitudinal fibres are said to contract, thereby retracting a portion of the gut from below into the gut above, while the circular fibres of the portion of gut above contract, thereby grasping the retracted portion. It is also offered as a theory that as a result of the contraction of these circular fibres reduction is prevented.

(d) Sex and nationality as causative factors were as follows :

(1) *Sex*.—In the nine cases reported five were males and four were females.

(2) *Nationality*.—Of the nine cases reported by the writer in this paper, two were of Irish-American, two were of German, and five were of Pole parentage.

Symptoms and signs of diagnostic importance occurred in our cases in the following order of frequency: Pain, shock, vomiting, restlessness, tenesmus, passage of bloody mucus or blood, tumor, obstruction, peritonitis, and sepsis.

Pain has been an ever-present symptom in all the cases seen, the child crying out for some time. The abdomen has been sensitive to touch, manifested by the child, if too young to speak, by flinching or crying.

Shock was evident in the majority of cases, lasting from a few minutes to the time of reduction or death. Vomiting was present in about 50 per cent. of the cases, and these were the cases of more than twenty-four hours' duration. It is well to remember that many of these cases are preceded by diarrhœa and vomiting, which may have been but accompaniments of some pre-existing condition.

Restlessness.—The patient moans and tosses or rolls from side to side during the disease, and continues so to do until reduction, sepsis, or gangrene takes place.

There is often an evacuation of fæces, after this condition arises, previous to the passage of mucus and blood; this fæcal matter comes from the bowel below the point of obstruction.

The author has not seen a single case in which some evidence of blood was not present.

Tumor.—The proverbial sausage-shaped tumor is not always found by palpation. In three of the operation cases no tumor was found, although the ablest diagnosticians in pædiatrics had carefully palpated the subjects. In each of these cases the symptom complex was so perfect of intussusception that operation was advised, accepted, and performed. In two of these cases the tumor was found well up under the ribs, in the left hypochondriac region, while in the third it was found under the right lobe of the liver.

In two of the operative cases of the author a small protrusion could be palpated high up in the lower bowel, upon digital examination.

Later the symptom complex changes, obstruction is complete, the pulse is thready and rapid, and manifestations of peritonitis and sepsis are evident.

THE TREATMENT.

In this disease, as in appendicitis, one cannot urge too strongly against the use of opium. In one of the cases operated upon by me this year, opium had been given, but in such minute doses that the family physician and myself thought no stress should be placed upon the possibility of the masking of symptoms. As a result of the apparent good condition of the child, unfortunately operation was delayed eight hours longer than it would have been had the opium not been given; and I am confident that our result would have been a recovery rather than a death had we operated at the time of our first visit.

The use of water- and air-pressure is justifiable in all cases of less than twenty-four hours' duration, and certainly water should be tried before operative interference is undertaken.

The reservoir should be suspended about three to five feet above the child. The child having been placed in the head-dependent position, either over the back of a chair or suspended by the heels, a few whiffs of chloroform are given to aid very much in restraining the efforts at expulsion on the part of the child, thereby allowing a greater amount of water to enter the bowel. When the intussusception is in the proximal end of the colon, or in the ileum, the water-treatment, as a rule, proves a failure. Massage of the tumor through the abdominal wall, when found, should be practised while the water is entering the bowel. Taxis by the above means should not be practised with any greater degree of frequency and duration than it would be in cases of strangulated hernia,—in other words, should a conscientious attempt at irrigation fail, then the operative procedure is demanded. Children will bear abdominal section very well, and we are quite satisfied that recovery will almost invariably follow in all cases in which operation is done in the first day, and that a very great proportion operated in the first half of the second day will also recover.

The relationship in recoveries from strangulated hernia and intussusception with regard to previous duration are very

similar. The longer the duration the greater the mortality, due to the same cause or causes in each disease,—shock, exhaustion, gangrene, and sepsis.

After exposing the tumor the following procedures are in order: Reduction, artificial anus, entero-anastomosis, and resection with end-to-end anastomosis.

The incision need not of necessity be a long one at the onset, for, if it is a case readily reducible, this can be done through a two- or three-inch incision in children, as well as through a much larger one, provided that the main principle of reduction be observed, and that is that, in reducing the gut, it must not be done by traction, but by the means of gentle pressure exerted through the intussusciens upon the apex of the intussusceptum. This will drive the intussusceptum from within the intussusciens. In our last case we reduced the major portion of the tumor, which occupied the left hypochondriac and lumbar regions, through a small incision and then, when the tumor approached the right lumbar region, the remaining mass was displaced from the abdomen through the small incision and a thorough inspection made. Traction upon the distal and proximal ends is very liable to be followed by lacerations of one or more coats, or a complete rupture of the walls of the intestine.

Pressure need never be so severe as to produce any injury to the integrity of the gut, as in all cases in which there are neither gangrene nor adhesions reduction is readily accomplished. Should the patient's condition demand haste, then and then only should an artificial anus be made, while in the cases in which haste is not a factor, typical resection with end-to-end anastomosis is the operation to perform.

The author would modify the operation of partial resection, as followed by Greig Smith, Barker, and others, by omitting the row of sutures between the intussusceptum and intussusciens, bringing the healthy gut through the longitudinal incision in the intussusciens, then tying off the mesentery, and finally cut off the intussusceptum, completing the operation according to Maunsell, thereby doing a typical resection with end-to-end anastomosis.

The author does not deem shortening or plication of the mesentery necessary, as it seems to him that adhesions form in most of these cases, and thereby obviate the necessity of sutures.

CASE I.—Reported before the Section on Surgery, New York Academy of Medicine, March, 1895 (*Medical Record*, p. 475, 1895).

Male, eight and a half months old, seen on the fourth day of the disease. Enemata had been unsuccessfully employed. No tumor was palpable either through the abdominal wall or per rectum. Cœliotomy was performed, and an intussusception of the enteric variety found in the left hypochondriac region. The mass was partially reducible; the remaining irreducible portion, almost six inches in length, was gangrenous. This gangrenous portion was removed and an end-to-end anastomosis with the Murphy button done. Septic peritonitis existed at the time of the operation. Death occurred within twelve hours.

CASE II.—Reported in the *New York Medical Journal*, April 16, 1898. F., male, aged nine years, was seized at four o'clock, Friday afternoon, August, 1897, with colicky pain in the abdomen, limited to the right side and of rather severe character. During the night he vomited the contents of the stomach and some bile, and passed a large quantity of blood and clots by the bowel. There was marked tenesmus and frequent attempts to have a movement of the bowels throughout the following day, but with no further result than the passing of mucus and blood. His temperature was said to have been normal, while the pulse was slightly increased. On Sunday his condition showed all the evidences of severe shock, and upon palpating the abdomen a rather elongated tumor could be mapped out in the right side. In the absence from the city of Dr. Carl Beck the case was referred to me by the family physician. I saw the patient at nine o'clock on Sunday night, and found the following condition: Countenance anxious, temperature 101° F., pulse 128, abdomen distended and tympanitic, painful to the touch, and a sausage-shaped tumor extending from the right iliac fossa to the costal cartilage of the tenth rib. I had the patient transferred to St. Mark's Hospital, opened the abdomen at ten o'clock, about fifty-eight hours after the onset of the symptoms, and found an intussusception of the enteric variety, the apex of which was within six inches of the ileo-cæcal junction.

The mass was irreducible and gangrenous, and the mesentery was gangrenous to within an inch of its attachment to the lumbar column.

In addition, the intestines were deeply engorged and a quantity of pus was found in the cavity. Resection of the mass and an end-to-end anastomosis with the Murphy button was performed, the abdomen thoroughly washed out with salt solution, and a gauze pack placed down to the anastomosis. The patient bore the operation very well and reacted nicely. During the two days following the operation he was given sixty cubic centimetres of Marmorek's serum without any evidences of improvement. The condition of sepsis increased, and the patient expired at the end of the fourth day following the operation.

Upon examining the specimen a mass of about two inches long was seen protruding at the distal extremity, which was made out to be a Meckel's diverticulum that had become inverted, and evidently was

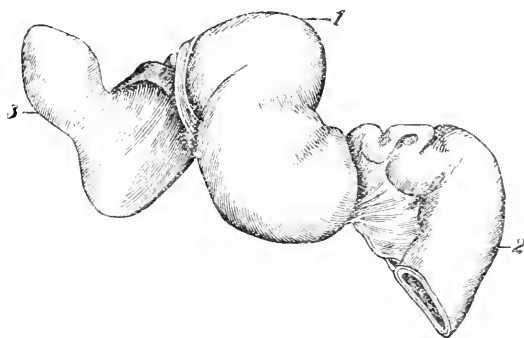


FIG. 1.—Specimen of intussusception. 1, Intussusciptum; 2, ileum; 3, Meckel's diverticulum (inverted) and intussusceptum.

the cause of the intussusception. Upon cutting the specimen open, it was found to measure thirty-three inches in length. This extreme length was due to the tight manner in which the intussusceptum was packed in the ensheathing intussusciptum. (Figs. 1 and 2.)

CASE III.—Female, aged four months, seen September 18, 1897. Condition extremely bad. Rapid, feeble pulse; cyanosis; apathetic. Temperature 101° F.; abdomen distended, quite tympanitic. No tumor upon palpation, due to abdominal distention. Previous history vague; had been ill for a week or more. The family stated that seventeen physicians had seen the patient during her illness. A diagnosis of intussusception had been made by the majority, and operation advocated by some, but was refused. Finally the family begged that an operation be performed. This was done within an hour of admis-

sion, and an ileo-cæcal intussusception found, readily reducible; but a general septic peritonitis existed, and death followed within twelve hours.

CASE IV.—Female, seventeen weeks old, well-nourished. Had had a previous day of diarrhœa, and was seized with pain, restlessness, and bloody, mucous dejections. Sent to the writer by Dr. Francis Huber, February 18, 1898. Enemata had been unsuccessfully tried. No mass or tumor palpable either by rectum or abdominal wall. Operation performed within the first eighteen hours; tumor found in right hypochondriac region, and was of the ileo-cæcal variety. Reduced readily. Patient stood the operation nicely, but was taken ill with pneumonia; then another lobe became involved; finally, recovery resulted. Suppuration occurred in the superficial layers of the wound. Discharged in five weeks.

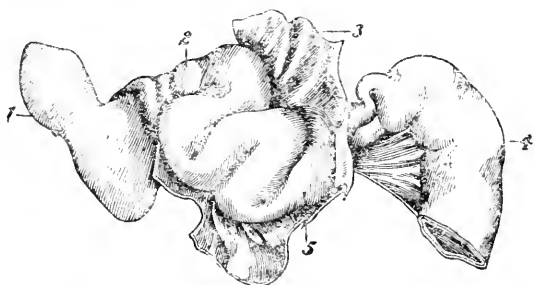


FIG. 2.—1, Meckel's diverticulum; 2, intussusceptum; 3, intussusciens split open; 4, ileum.

CASE V.—Female, exactly five months old. Sent to the writer by Dr. Joseph Huber, February 23, 1898. Patient had suffered from tetany for some weeks. Bottle-fed and poorly nourished. History of previous diarrhœa and of intussusception of a few hours' duration. When seen by the writer there was pain, restlessness, blood-tinged mucous stools, but no tumor upon abdominal palpation. By digital examination a protruding mass, high in the bowel, could just be felt. Several enemas were given, and upon digital examination the protrusion could not be felt. She was placed in bed and slept quietly for eight hours. Upon awakening she became restless, and had a blood-tinged mucous stool. Operation was performed. The tumor was found in the left hypochondriac region, extending down to the lumbar region. It was of the ileo-cæcal variety. The tumor was fixed in this region, and, upon searching for the cause of its irreducibility, it was

found that a hernia of the small intestine had taken place through the foramen of Winslow. Several coils being reduced before the fixation of the intussusception could be relieved, the tumor was readily displaced and reduced by pressure through the intussusciens upon the apex of the intussusceptum. This child also recovered, but during three weeks following the operation there was absolutely no evidence of union in the abdominal wound. The intestines protruded upon several occasions. Secondary sutures were placed twice, and upon two occasions blue pus was present upon the dressings. During the third week repair began. The child was discharged between the sixth and seventh weeks.

CASE VI.—Male, thirty-eight years of age, admitted to Gouverneur Hospital, March 17, 1898. When seen by the writer he stated that he had had colicky pain that morning. Examination: Slight evidence of shock; pain in abdomen; local tenderness in left hypogastric and lumbar regions; vomiting; had a rather large bloody mucous stool. Palpation: Very sensitive upon left side; a tumor elongated in shape could be felt in the left lumbar region. Three pints of saline solution were given after a three-pint simple enema; both were negative in results. Bloody stools continued at intervals. Operation not indicated by patient's general condition. March 18: Three-pint injection of salt water followed by bloody mucus only. Pain eased some. March 19: Enema of three pints of soap and water. Pulse 100.2° F. Tumor disappeared. Calomel, ten grains, and eleterin, one-tenth of a grain, were given. March 20: Large movement. March 21: Patient discharged.

CASE VII.—This case occurred in the practice of Dr. M. Dantes during March, 1898, who cited the history to me with a view to treatment. Female, aged three and one-half months, ill two days when seen by Dr. Dantes. She had had diarrhœa, and vomited a few times during these days. When seen there were bloody, mucous stools, pain, and restlessness. No tumor found by abdominal palpation, but evidences by rectal examination. Enema proved of no avail. Operative interference refused; child died on the twelfth day of the disease with all the evidences of a septic peritonitis. During the latter days of her life foul-smelling discharges were evacuated, but no sloughs.

CASE VIII.—This case was referred to me by Dr. Eynon, and is the one to which reference was made, in the beginning of this paper, of opium masking the symptoms.

Patient was a male, four months and four days old, born in the United States, of Irish-American parents. The onset was at 3 P.M.

on a Monday, with considerable shock, some vomiting, and bloody stools. Two hours later high enemas were given, apparently with success, as the shock and pain were mitigated. The tumor, palpable through the abdominal wall and also through the rectum, reappeared and was again treated with like result. This recurrence and apparent reduction occurred several times,—four or five (?). The child was given minim doses of paregoric. On Tuesday—*i.e.*, the following morning—shock and pain were decided, tumor was present, bloody fæces were evacuated. When I saw the child, at or about 4 P.M. on Tuesday, or about twenty-five hours after the onset, a tumor was palpable through the abdominal wall upon very deep pressure, and could be outlined by rectal and abdominal palpation. The child's condition was apparently excellent, the mother stating that he had slept for some time previous to our visit; that there had been a little vomiting and a small, slimy, blood-tinged stool. Pulse and respiration were good. Enemas were used again with what appeared to be a reduction, no tumor being palpable afterwards. The child was put to bed and slept. We remarked at the time that even if the opium was given in small quantity, that the symptoms could be so masked as to cause regret for not operating, and that we would keep prepared for emergency until the following day. At 9.30 of the same day we were again called, and found the original condition of the tumor, with a manifestly bad condition of the child (opium had been withdrawn at our first visit). A median incision was made, a tumor of the ileo-colic variety was found, with several lacerations of the serosa and musculosa of the intussusciptions, the gut was œdematous, omentum markedly congested, and a bloody serous fluid in the abdomen.

We were able to reduce the mass with some difficulty, then sutures were taken in the intestinal walls at the sites of lacerations, and the toilet of the peritoneum, etc., made. The operation occupied less than thirty minutes; the child was returned in a fair condition, but died of sepsis within eighteen hours after the operation.

CASE IX.—Through the kindness of Dr. Joseph D. Bryant the following case was seen and operated upon by me in August of this year:

Fred. S., ten months old, born in the United States, of Polish parents. On August 16, at 4 P.M., was seized with an attack of screaming, and showed evidence of great pain, which was referred to the abdomen. The family physician, Dr. Friedman, called in Dr Bryant, who very kindly referred the case to my service in Gouverneur Hospital. When I saw the child, at twelve o'clock midnight, the fol-

lowing symptom complex was present: Child was in a mild degree of shock, pulse rapid but of good quality, restless.

Palpation revealed a tumor in the left upper quadrant of the abdomen; the abdomen was painful upon manipulation. The mass could not be felt by digital examination at this time. Some bloody mucus was present.

All preparations for abdominal section were made. Water was unsuccessfully used, and laparotomy was done. An incision three inches in length was made in the median line, the tumor readily located with the examining finger, but was so firmly fixed as to prevent its displacement through the incision. Reduction was tried by pressure, with the result of being able to reduce the size of the tumor to about one-quarter of its length, and to cause the mass to recede from its left upper quadrant position to the right lumbar. At this time we were able to displace the remaining mass through the incision, and reduce it without a particle of trouble. It was of the ileo-cæcal variety, the appendix and ileo-cæcal junction being the last portions reduced. The abdominal wound was sewed in three layers, a buried suture being used in the skin. Rubber protective was placed upon the line of the wound to prevent infection by means of urine, etc. The dressings were not removed until the fourteenth day, when the patient was discharged.

It will be seen by the following table that of nine cases one recovered by injections, or 11 per cent.; one died after injections, having refused operation. Seven cases were operated upon, with three recoveries, practically 43 per cent. Of the four deaths, it can be said that two had practically no chance for recovery, and the third but a very slight chance. There were three (Cases I, II, and III) septic at the time of operation, Cases I and II being gangrenous. In Case VIII, the case cited as having had opium, the symptoms being masked to such a degree as to deceive us as to the patient's actual condition, thereby causing a delay of eight hours in the operation.

In four of the reported cases a tumor was palpable, and in two of the cases in which tumor could not be felt on palpation the tip of the intussusceptum could be felt by rectal examination.

Had we to operate again in Cases I and II, we would not have resected, but established an artificial anus.

It will also be noted that children of Polish parentage suffer

more than of the mixed races 5 to 4. This may be accounted for by my region of supply being in a neighborhood infested with this class, although all the cases, but one, were sent me as private patients. Sex was almost equally divided, five being in males and four in females. As before stated, the ileo-colic variety was most frequently represented; one being ileo-cæcal, four ileo-colic, two enteric, and two unknown.

It is also interesting to note that 50 per cent. of recoveries occurred in the cases of infants, one of the reported deaths being in a lad nine years of age.

SYNOPSIS OF CASES.

CASE I.—Age, eight and one-half months. Sex, male. Born in United States. Parents, Irish-American. Duration, four days. Condition of patient, septic. Tumor palpable, no. Water tried, unsuccessful. Operation, yes. Condition of gut, gangrenous. Variety, enteric. Reduced, no. Resection, yes, Murphy button. Result, death in twelve hours.

CASE II.—Age, nine years. Sex, male. Born in United States. Parents, German. Duration, two and a half days. Condition of patient, septic. Tumor palpable, yes. Water tried, unsuccessful. Operation, yes. Condition of gut, gangrenous. Variety, enteric. Reduced, no. Resection, yes, Murphy button. Result, died on fourth day.

CASE III.—Age, four months. Sex, female. Born in United States. Parents, Poles. Duration, seven days. Condition of patient, septic. Tumor palpable, no. Water tried, unsuccessful. Operation, yes. Condition of gut, congested and œdematous. Variety, ileo-cæcal. Reduced, readily. Resection, no. Death in twelve hours.

CASE IV.—Age, seventeen weeks. Sex, female. Born in United States. Parents, Poles. Duration, eighteen hours. Condition of patient, fair. Tumor palpable, no. Water tried, unsuccessful. Operation, yes. Condition of gut, congested and œdematous. Variety, ileo-colic. Reduced, readily. Resection, no. Result, recovered, complicated with pneumonia.

CASE V.—Age, five months. Sex, female. Born in United States. Parents, Poles. Duration, twenty hours. Condition of patient, poorly nourished. Tumor palpable, no; felt by rectum. Water tried, unsuccessful. Operation, yes. Condition of gut, congested and œdematous. Variety, ileo-colic. Reduced, readily. Resection, no. Result, recovered.

CASE VI.—Age, thirty-eight years. Sex, male. Born in Poland. Parents, Poles. Duration, sixteen hours. Condition of patient, good. Tumor palpable, yes. Water tried, successful. Operation, no. Result, recovered.

CASE VII.—Age, three and one-half months. Sex, female. Born in United States. Parents, German. Duration, two days. Condition of pa-

tient, fair. Tumor palpable, no; felt by rectum. Water tried, unsuccessful. Operation, refused. Result, death on twelfth day.

CASE VIII.—Age, four months, four days. Sex, male. Born in United States. Parents, Irish-American. Duration, thirty-six hours. Condition of patient, apparently good. Tumor palpable, yes. Water tried, unsuccessful. Operation, yes. Condition of gut, congested, œdematous; two large lacerations of wall; peritonitis. Variety, ileo-colic. Reduced, some difficulty. Resection, no. Result, died; small doses of paregoric; marked symptoms.

CASE IX.—Age, ten months. Sex, male. Born in United States. Parents, Poles. Duration, ten hours. Condition of patient, good. Tumor palpable, yes. Water tried, unsuccessful. Operation, yes. Condition of gut, œdematous and congested. Variety, ileo-colic. Reduced, readily. Resection, no. Result, recovered.

Total, five males and four females. Tumors in four palpable; in five, not; in two by rectum. Water tried, in one successful, in eight unsuccessful. Operated on, seven; refused, one. Reduced with enemas, one. Variety, ileo-colic, four; ileo-cæcal, one; enteric, two; unknown, two. Reduced by operation, five; two not; one by water; one not by water. Resections, two. Result, three operative recoveries; one enema recovery; four operative deaths; one non-operative death; recoveries by operation, forty-three per cent.

INTERSCAPULO-THORACIC AMPUTATION.¹

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(Concluded from page 64.)

THERE are yet other cases which will not admit of classification with any of the foregoing, cases in which either resection of the humeral head or of the scapula has preceded interscapulo-thoracic amputation, and these I have placed separately. These are the cases of Syme, Fergusson, Hamilton, Desprès, and Madelung, five in all. One of these, that of Madelung, is incorrectly incorporated by Berger in his table of 1898 as a primary interscapulo-thoracic amputation, though he admits that a resection of the head of the humerus was done six years before by Trendelenburg. Four of these cases recovered; and in the other case (Hamilton) there is not sufficient data. In two of the cases, Syme's and Madelung's, there had been resection of the humeral head; in three, resection of the scapula. As for recurrence, the data is insufficient in two cases; two cases were in good health one year after interscapulo-thoracic amputation had been done, and one died in seven months from recurrence in the peritoneum. The effect of adding these as well as the previous cases to the table of typical cases would be to still further lower the mortality of the operation to ten per cent.; raise the number of apparent cures to sixteen, and the number of cases of recurrence to twenty, making the percentage of ultimate cures over forty-four.

¹ Read in abstract before the Brooklyn Surgical Society, June 2, 1899.

(III) CASES OF INTERSCAPULO-THORACIC AMPUTATION PRECEDED BY RESECTION OF THE SCAPULA OR OF THE HUMERAL HEAD.

CASE LXXVIII (1862, September 16, 1863, January; 1863, May 7. J. Syme, Edinburgh. Male, aged forty. Osteofibro-cartilaginous tumor, which had been in existence for one year. (1) Resection of the head of the humerus. (2) Removal of the growth from the shoulder. (3) Interscapulo-thoracic amputation. After the second operation the tumor recurred in the scapula. At the third operation nineteen arteries were ligated. Recovery. No recurrence one year after the operation. Reference, Syme, "Excision of the Scapula," Edinburgh, 1864.

CASE LXXIX (1865, January 14; November 11).—William Fergusson, London. Female, aged nineteen. Fibro-recurrent tumor of the infraspinous fossa. It had been present four years. (1) Resection of the infraspinous fossa of the scapula. The tumor, when removed, was the size of a cocoanut. (2) Interscapulo-thoracic amputation. Recovery. After the first operation the tumor recurred in June of the same year. There was a good functional result following the first operation. No data concerning the final result. Reference, *Lancet*, London, 1865, Vol. ii, pp. 233 and 592; *Medical Times and Gazette*, 1865, Vol. i, pp. 62 and 592; also Vol. ii, pp. 574 and 706.

CASE LXXX (1865, February 15, 1868; February 12, 1870; December 13).—Hamilton, New York. Male. Colloid tumor. (1) Resection of the anterior border of the scapula; (2) Resection of a small part of the scapula; (3) Interscapulo-thoracic amputation: recovery(?). There was no recurrence following the first operation until January, 1868. Reference, *New York Medical Record*, 1871-72, Vol. vi, p. 141.

CASE LXXXI (1881, December; 1882, June 19).—A. Desprès, Paris. Male, aged twenty-two. Osteosarcoma. (1) Resection of the infraspinous portion of the scapula; (2) Interscapulo-thoracic amputation. Recovery. Death in seven months from metastasis in the peritoneum and post-peritoneal glands. There was a history of injury eleven years before the first operation. The tumor had been present for two years and a half. Recurrence took place three months after the first operation. The subclavian vessels were ligated preliminarily. Air entered the vein and caused syncope. Reference, *Bulletin de l'Academie des Sciences*, T. vi, revue par Am. Desprès, Paris, 1884, p. 968.

CASE LXXXII (1880, February; 1886, December 9).—Trende-

lenburg, Madelung. Male, aged forty-two to forty-eight. Enchondroma molle of the left humerus following a blow in 1878. (1) Resection of the head of the humerus; (2) interscapulo-thoracic amputation: recovery. The patient was able to resume his work about two months after the first operation. In 1883 he fell on his shoulder, and since then a tumor gradually developed, until at the time of the second operation it had become as large as a man's head. Preliminary ligation was found impossible. The Esmarch bandage was used. Reference, *Deutsche Zeitschrift für Chirurgie*, 1882, Vol. xxv, 330; *ibid.*, 1888, Vol. xxvii, p. 238.

Two cases were operated upon by this method for *carcinoma of the breast*, involving the vessels and shoulder region. Morisani and Treves each report one case. Morisani's case died four hours after the operation. Treves's case recovered, and was greatly benefited in regard to freedom from pain and greater of general comfort.

(IV) INTERSCAPULO-THORACIC AMPUTATION FOR CARCINOMA OF THE BREAST.

CASE LXXXIII (1885, March 15).—Domenico Morisani, Naples. Female, aged fifty-four. Carcinoma of the right breast, axilla, and shoulder-joint. The tumor had been growing between sixteen and seventeen years. Interscapulo-thoracic amputation with removal of the clavicular portion of the tumor. In addition to this, the second, third, and fourth ribs were resected. Preliminary ligation of the subclavian vessels was practised. Death followed, four hours later, from shock. Reference, *Il Morgagni*, Agosto, Ottobre, 1885, Vol. xxvii, p. 505.

CASE LXXXIV (1891).—Frederick Treves. Female, aged fifty-seven. Recurrent carcinoma of the right breast. The original tumor had been removed two years previously. There was intolerable pain and great œdema of the arm. Interscapulo-thoracic amputation: recovery. The patient was much more comfortable after the operation. Reference, *Lancet*, London, 1891, Vol. ii, p. 59.

There yet remain three cases which I have been compelled to leave unclassified.

(V) UNCLASSIFIED CASES OF INTERSCAPULO-THORACIC AMPUTATION.

CASE LXXXV (1872, April 23; 1875, March 9; 1876, September 5; 1877, April 15; 1878, January 29; 1879, March 20).—

Kappeler, Münsterlinger. Female, aged twenty-five. Chondroma. (1) Resection of the infraspinous portion of the scapula; (2) further resection of the scapula; (3) resection of part of the acromion; (4) further resection of the acromion and coracoid; (5) removal of the clavicle; (6) disarticulation at the shoulder-joint. Recovery. In March, 1880, the patient was still free from recurrence. Death from recurrence took place less than a year after this. Reference, H. Walder, "Ueber Chondrom der Scapula," Dissertation, Leipzig, 1881.

CASE LXXXVI (1888).—John A. Wyeth. Female, aged fifty-five. Sarcoma of the deltoid. Interscapulo-thoracic amputation. Half of the scapula was left. Recovery. Recurrence took place, and death ensued eight months after the operation. Reference, *New York Medical Journal*, 1891, Vol. i, p. 57.

CASE LXXXVII (1889).—Von Bergmann. Female, aged thirty-eight. Sarcoma of the right humerus. Interscapulo-thoracic amputation with resection of the first rib and part of the sternum. Ligation of the superior vena cava and the right brachio-cephalic trunk. Died two hours after the operation. The muscles were extensively involved in this case. There had been a pathological fracture of the humerus. Reference, Nasse, Berger.

(VI) CONSECUTIVE INTERSCAPULO-THORACIC AMPUTATION.

Cases in which removal of the scapula and clavicle followed disarticulation at the shoulder-joint, twenty-six cases.

CASE I (1831, November 3; 1837, September 28).—R. D. Mussey, Cincinnati. Male, aged twenty-seven. Chondroma undergoing sarcomatous changes. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and clavicle. Recovery. When the patient was twenty-seven years of age two bony tumors were removed, with the metacarpal bone of the thumb and the distal half of the metacarpal bone of the forefinger. One was larger than a hen's egg, the other somewhat smaller. Both were upon the right hand. Two years later pain was felt in the arm. This was more or less constant for eleven years. During the last two years of this period the pain was mostly in the region of the shoulder. During the last year the soft parts about the upper arm and shoulder enlarged to twice their normal size. In 1831 (thirteen years after the first operation) the arm was disarticulated at the shoulder-joint. Five years later the stump became painful and a tumor appeared. In 1837

the clavicle and scapula were removed with the tumor. Air entered the subclavian vein during this operation. There was no recurrence thirty years later. Reference, *American Journal*, 1837, Vol. xxi (Old Series), p. 390.

CASE II (1835).—Crosby, of Hanover, U. S. Male, aged thirty. Osteosarcoma. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and clavicle (the sternal end of the clavicle was not removed). Recovery. Died from metastasis in the lumbar vertebræ four years later. This case was never reported by the operator, but his son, Professor A. B. Crosby, sent an account of the case to Stephen Rogers. Reference, *New York Medical Journal*, 1869, Vol. viii, p. 434.

CASE III (1841, May 9; 1842, 10 months later).—Rigaud, Strasbourg. Males, aged fifty and fifty-one. Osteosarcoma. (1) Disarticulation at the shoulder joint; (2) removal of the scapula and clavicle (outer end). Recovery. No recurrence three years after the second operation. The tumor had been present since 1835. It had recurred in the cicatrix eight months after the first operation. In consequence of the ligation of the axillary artery at the first operation the subclavian was found obliterated. Reference, *Archives générale*, 1844, p. 521; also A. Pfrenger, "Ueber die Resection der Schulterblätten," Dissertation, Würzburg, 1846, p. 10; also *Gazette médicale de Strassbourg*, 1884.

CASE IV (1842 ?).—Conant. Male. Cancer. (1) Disarticulation of thumb; (2) disarticulation of wrist; (3) amputation of forearm; (4) amputation of the arm; (5) disarticulation at the shoulder-joint; (6) removal of the scapula and clavicle. Recovery. No recurrence after twenty years. Reference, *Presse médicale Belge*, 1863, Vol. xv, p. 344; also *Dublin Medical Press*; also *American Medical Times*.

CASE V (1857, February 17; April 21).—Soupart. Male. Fibroplastic tumor. (1) Disarticulation at the shoulder-joint; resection of the acromion, glenoid cavity, and anterior border of the scapula; (2) removal of the remainder of the scapula. Recovery. Recurrence took place in the wound in three weeks, and death ensued on July 12 of the same year. Reference, *Gazette médicale de Paris*, 1866, p. 277; also, *Annales de la Société de Médecine de Gand*, 1858, Vol. xxxvi.

CASE VI (1859, November 25; 1860, April 14).—Von Langenbeck. Male, aged twenty-three. Fibrosarcoma of the upper epiphysis of the humerus. (1) Disarticulation at the shoulder-joint; (2)

removal of the scapula and three-fourths of the clavicle. Recovery. Death from recurrence in the lung one and one-half years later. The first recurrence was in the supra- and infraspinous region and in the acromion. At the second operation the subclavian artery was ligated preliminarily. Reference, *Deutsche Klinik*, 1860, p. 217; also, Von Langenbeck's Archiv, 1862, Band. iii, p. 306.

CASE VII (1861, May).—Wilh. Busch, Bonn. Female, aged sixteen. Osteosarcoma of the left humerus with axillary involvement. (1) Disarticulation at the shoulder-joint and removal of the axillary glands; (2) removal of the scapula and the greater part of the clavicle. Recovery. Recurrence occurred in the shoulder-girdle five weeks after the first operation. At the second operation the subclavian artery was ligated preliminarily. There was no recurrence six years after the operation, when the patient died of typhoid. Reference, Adelmann, personally communicated by the author.

CASE VIII (1863, 1868).—Krackowizer. Enchondroma. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula without the clavicle. Died in seven days from exhaustion. Reference, *New York Medical Journal*, 1869, Vol. viii, p. 440.

CASE IX (1864).—Déroutbaix, Brussels. Malignant tumor. (1) Resection of the head of the humerus; (2) disarticulation at the shoulder-joint; (3) removal of the scapula. Recovery. Death in one month from recurrence in the lungs. Reference, *Gazette médicale de Paris*, T. xxi, p. 277; Adelmann, communication from Michaux.

CASE X (1864).—Gurdon Buck. Male adult. Osteocancer. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and clavicle. Recovery. Died from recurrence in a few months. Reference, *American Journal*, 1868, N. S. 56, p. 371.

CASE XI (1869, 1870?)—Rigaud, Strasburg. Male. Osteophyte. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula one and one-half years later. Recovery. No recurrence six years later. Recurrence took place in the scapula after the first operation. Reference, *Centralblatt für Chirurgie*, 1876, No. 33, p. 528; *Bulletin de la Société de Chirurgie*, Paris, 1875.

CASE XII (1872, January; July).—Daniel Stimson, New York. Male, aged forty-two. Fascial sarcoma. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and part of the clavicle. No final result is noted. There had been a fracture of the humerus two years before. There was a rapid recurrence after the first operation. Reference, *New York Medical Record*, 1872, Vol. vii, p. 578 (December 16).

CASE XIII (1873, August, December 14).—C. S. Jeaffreson. Female, aged twenty. Encephaloma (osteoid cancer) of the upper extremity of the left humerus, rapid in growth. A few weeks before the operation there had been a spontaneous fracture of the humerus. (1) Disarticulation at the shoulder-joint. There was rapid recurrence in the wound and pectoral region. (2) Removal of the scapula and three-fourths of the clavicle. Recovery. No subsequent data. Reference, *Lancet*, London, 1874, Vol. i, p. 759.

CASE XIV (1878, December; 1879, November 14).—Aniello a' Ambrosio. Female, aged eighteen. Fascial sarcoma. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and the outer part of the clavicle. The tumor had been present for six months, and was the size of a child's head. Recurrence in the cicatrix took place after the first operation. Preliminary ligation of the subclavian artery was done. Air entered the vein. Death in eighteen days from infection. Reference, "Ricerche di patologia e di clinica chirurgica," Naples, 1883, Vol. i, p. 1.

CASE XV (1881, January 15; June).—John Wood. Female, aged seventeen. Sarcoma of the left humerus of three months' history. (1) Disarticulation at the shoulder-joint. In April the disease recurred in the scapula. (2) Removal of the scapula and one-half of the clavicle. The subclavian was compressed after division of the clavicle. Very little blood was lost. Died the same evening of shock. Reference, *Lancet*, London, 1881, Vol. i, p. 952.

CASE XVI (1882, February 7; August 30).—W. J. Conklin. Female, aged thirty-seven. Osteosarcoma. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and three inches of the clavicle. Recovery. After the first operation recurrence took place in the scapula in three months. The original tumor had been present for six years. The patient finally died twenty-five months after the operation from recurrence in the lung. Reference, *American Journal*, 1883, N. S., Vol. lxxxv, p. 102.

CASE XVII (1885, November 27; 1886, July 22; 1887, January 24).—Von Bergmann. Male, aged seventeen. Sarcoma of the left forearm. (1) Amputation above the elbow; (2) extirpation of the tumor in the axilla; (3) removal of the scapula, clavicle, and the rest of the humerus. Recovery. There was rapid recurrence after the first operation. Recurrence took place three months after the second operation. Preliminary ligation of the subclavian artery and vein was done at the third operation. No subsequent data. Reference Bramsfeld, Dissertation.

CASE XVIII (1886, February 11; April 24).—Paul Swain, Plymouth. Male, aged eighteen. Myeloid sarcoma. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and part of the clavicle. Recovery. The tumor was of two months' duration. It recurred in the scapula one month after the first operation. Died of pneumonia within six weeks of the operation. Reference, *Lancet*, London, 1887, Vol. i, p. 20.

CASE XIX (1886, March 13; 1888, June 8).—Wats. Male, aged thirty-one. Fascial sarcoma of the humerus. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and clavicle. Recovery. After the first operation the disease recurred in the scapula. There was rapid recurrence after the second operation. Reference, Schultz, 12, p. 456.

CASE XX (1887; 1889, August).—Von Eiselsberg. Male, aged forty. Chondrosarcoma. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and clavicle. Recovery. Recurrence took place in the shoulder region after the first operation. The final result is unknown. Reference, Schultz, 21, p. 457.

CASE XXI (1888, April 13; 1888, May 30).—Wats. Male, aged fourteen. Sarcoma. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and clavicle. Recovery. Recurrence took place in the scapula after the first operation. Death from recurrence within four months. Reference, Schultz, 10, p. 455.

CASE XXII (1890; four months later).—B. Jessett. Male, aged twenty-two. Myeloid sarcoma of the humerus. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and one-half of the clavicle. Recovery. Five weeks before the second operation the disease recurred in the scar and was removed. No further data. Reference, *Lancet*, London, 1890, Vol. i, p. 131.

CASE XXIII (1891).—Von Bergmann. Sarcoma. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and clavicle. Recovery. The site of the recurrence, after the first operation, is not stated. Death from recurrence. Reference, Schultz, 36, p. 459.

CASE XXIV (1893, March; August).—Jordan. Male, aged twenty. Chondrosarcoma. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and the clavicle. Recovery. Recurrence took place nine months later. The site of the recurrence, after the first operation, is not noted. Reference, Heddæus, Case II, *Beiträge zur klinische Chirurgie*, 1897, Vol. xviii, p. 775.

CASE XXV (1896, April 5; 1897, August 23).—R. Humphrey Martin. Female, aged twenty-six. Spindle-celled sarcoma of the

upper extremity of the humerus, of six months' growth. (1) Disarticulation at the shoulder-joint. The patient suffered greatly from shock. Recurrence took place over the dorsum of the scapula sixteen months after the operation. (2) Removal of the scapula and two-thirds of the clavicle. There was no shock. Recovery. Death from recurrence in the thorax about one year later. Reference, *Inter-colonial Medical Journal of Australasia*, 1898, Vol. iii, pp. 482-485.

CASE XXVI (1896, June).—Quénu. Female, aged twenty. Sarcoma. (1) Disarticulation at the shoulder-joint; (2) removal of the scapula and clavicle. Recovery. Recurrence took place after the first operation in the cicatrix and deltoid. Duplay did the first operation. Death occurred eight months after the second operation from lung involvement. Reference, Berger, *Revue de Chirurgie*, 1898, p. 881.

Site of Recurrence after Disarticulation of the Shoulder-Joint.—

In nine cases the site is not noted; seven cases recurred in the scar; eight in the scapula; one in the scapula and clavicle; one in the "shoulder region."

Variety of Tumor.—Twenty of these cases were varieties of sarcoma. There was one reported as cancer; one fibro-plastic tumor; one enchondroma; one malignant tumor; one osteophyte; and one encephaloma.

Mortality.—Three cases died as a result of the operation: No. VIII, in seven days from exhaustion; No. XIV, in eighteen days from infection; No. XV, the same evening from shock. In one case, No. XII, the result is not noted. All the other cases recovered. This makes the mortality 12 per cent., slightly higher than that of the primary operation. Removal of the scapula and clavicle, consecutive to disarticulation, has a mortality of about 13 per cent. According to Berger, Schultz reached the same conclusion. Only cases reported subsequent to 1875 were used in their conclusions. It is when interscapulo-thoracic amputation is done for tumor of the scapula that the highest mortality occurs. This can be readily explained. When the operation is done for tumor of the humerus, preliminary ligature of the axillary or subclavian is comparatively easy and hæmostasis readily accomplished; on the other hand, tumors of the scapula, by reason of their size and location, render pre-

liminary ligation of the subclavian vessels uncertain, very difficult, and in some cases impossible; for instance, the enormous pathological development of the vessels in the neighborhood of the tumor, particularly the superior scapular artery and vein, and the posterior scapular artery and vein, increase greatly the chances of severe hæmorrhage during the subsequent stages of the operation. In addition, involvement of the scapular and clavicular muscular attachments render the operation still more difficult, and the case much more prone to relapse.

Final Results.—In arriving at the percentage of final recoveries, we set aside those cases which died as a result of the operation (Nos. VIII, XIV, XV), the one case which died of intercurrent disease soon after the operation (No. XVIII), and three in which there is no record of the final result (Nos. XII, XIII, XVII, XX, XXII). Twelve of the remaining cases died of recurrence (Nos. II, V, VI, IX, X, XVI, XIX, XXI, XXIII, XXIV, XXV, XXVI). Five cases are classed as cured. Of these, that of Mussey (No. I) was alive and well thirty years after the last operation; that of Rigaud (No. III) three years afterwards; that of Conant (No. IV) twenty years; Busch (No. VII) six years; and the Rigaud second case (No. XI) six years. If we allow the question of malignancy in these five cases to pass undisputed, we find that $29\frac{2}{3}$ per cent. made an ultimate recovery. That these cases were malignant is proved by the number of times each recurred. Three were diagnosed clinically as sarcoma, one as an osteophyte, and one as cancer. Berger included in his table of twenty-three cases but four of these cases as cured, but I have corroborated each of them. He further states that two of his four cases were reported two and four months respectively after the removal of the scapula; but my researches prove that three cases were well three years and more after the operation, and hence must be classed as final cures. He disputes the malignancy of Rigaud's second case (No. XI of this list), which was well six years after the operation, by saying that the diagnosis is vague, the term "osteophyte" being used. However vague the term may be, there is no doubt of the malignancy of a case which, after disarticulation at the shoulder-joint, recurred in the body of the scapula

He even doubts that the remaining case, Conant's, was malignant. This case (No. IV of our list) had the term osteocancer applied to it. Five operations, ranging from disarticulation at the thumb to disarticulation at the shoulder, were performed before the final removal of the scapula and clavicle; yet Berger doubts the malignancy of the growth! There is scarcely a case in his table which may be called cured, according to Berger. His idea in claiming the vast superiority of primary interscapulo-thoracic amputation over consecutive interscapulo-thoracic amputation is correct, but he overdoes the matter in claiming that there are no cures after the consecutive procedure.

The superiority of primary interscapulo-thoracic amputation is amply proved by a comparison of the preceding tables. The mortality of this operation is less than that of the consecutive operation. While at the very outside limit the consecutive operation has cured $29\frac{2}{3}$ per cent., the primary operation has cured over 56 per cent.

It is but natural to suppose that an operation which allows of so much more radical treatment of the disease, as does interscapulo-thoracic amputation, as compared with simple disarticulation, should offer much greater hope for permanent relief. That it is necessary to go wide of the disease, especially in the case of sarcoma, no one will doubt. It is a fact that sarcoma offers a very bad prognosis as treated by present methods. Taking disarticulation of the hip for sarcoma of the femur, for example, out of eighty-seven cases collected by Borck and traced, not a single instance of definite cure can be proven. In the case of the femur we are limited by the os innominatum in our endeavor to extirpate the disease; but in the case of the humerus we are not limited. There is presented for our consideration an operation the mortality of which is less than a disarticulation at the hip-joint, and less than the mortality of disarticulation at the shoulder. It has the merit, also, of going wide of the disease for which it is done. By performing it we do all that can be done towards radically relieving our patient of a disease which, if treated by palliative operative procedure, invariably leads to a fatal termination.

It is well known that amputation through the bone above

that affected by osteosarcoma gives the best results, so far as local recurrence is concerned. Poncet, Gross, and Schwartz have called attention to this point. The number of recurrences following disarticulation at the shoulder-joint show conclusively the need for a more radical operation. Gensoul, Daniel Gilbert, and Humphrey have advocated more or less extensive resection of the scapula in addition to disarticulation. Keen, of Philadelphia, in a paper read before the American Surgical Association in 1895, in one line states that interscapulo-thoracic amputation "is perhaps also indicated in tumor of other parts of the humerus (than the superior extremity) invading the soft parts." Pathological examination of these cases show that the scapula muscles are more frequently the site of the recurrence, hence the additional partial resection of the scapula is not sufficient. To be of benefit the entire scapula and muscles must be removed primarily, not as a secondary procedure. When the muscles of the scapula are perceptibly involved, rapid recurrence is almost certain. Out of seven cases operated upon by Bergmann in his clinic in Berlin four showed involvement of the scapula at the time of operation, and these promptly died, two of local recurrence and two of generalization of the disease; in the other three cases the scapula muscles were not involved, and these cases remained free from the disease when last heard from, one for ten months, one for one year (dying of some unknown disease), and one for three and a half years. These were all cases of sarcoma. Moreover, the operation also offers a complete clearing or rather an obliteration of the axilla, and the soft parts in the neighborhood, and while sarcoma does not necessarily extend through the glands, results have conclusively shown, I think, that the soft parts in and around the axilla are quite frequently the seat of disease even when an appreciable thickening or tumor is not discoverable by palpation. One must verily have a microscope in the finger-tips to definitely say just where tissue containing sarcomatous elements ceases and normal tissue begins. Absolutely the only safe plan to pursue is to remove all the tissue that is compatible with the maintenance of life, so that if recurrence occurs, we have no possible reproach from our conscience. Having given a case the benefit

of interscapulo-thoracic amputation we have done all that human hands can do to prolong, and perhaps save, the patient's life.

The question is not, shall a resection or a disarticulation be done, but will even an interscapulo-thoracic amputation remove all the disease? What surgeon is there so wise who will lay his hand on the scapula or clavicle, or tissues in the axilla, or neighborhood of the shoulder-joint, in a case of sarcoma of any portion of the humerus, and say, "The disease has not extended thus far"? Just as in the case of sarcoma of the femur, not a single case of permanent cure can be proved; so I believe, in the case of the humerus, that disarticulation is but a palliative measure. It should be one of the cardinal axioms of surgery that sarcoma of a long bone is not cured by extirpation of that bone alone, for the reason *that in the vast majority of cases healthy flap-structures cannot otherwise be obtained than by going through the bone above.*

CONCLUSIONS.—As a result of a study of the above cases, and a study of many others which have died from recurrence following disarticulation and other palliative operations, I believe it may safely be considered proved that (1) sarcoma of the humerus offers slight chance of ultimate cure by any but the most radical procedure. (2) The operation of choice for sarcoma of any part of the humerus is primary interscapulo-thoracic amputation.

Prosthesis.—Berger and Adelman have each described a prosthetic apparatus for use following interscapulo-thoracic amputation. It is claimed that this is fully as useful as the apparatus for use following disarticulation at the shoulder. However this may be, it need hardly influence the decision as to the operation when the immense advantages of the complete amputation is considered.

Four other cases collected were operated upon for osteomyelitis and extensive caries. These all recovered; the recovery being recorded as permanent in one case.

(VII) INTERSCAPULO-THORACIC AMPUTATION FOR CARIES.— THREE CASES.

CASE I (1840-1847, February 6).—William Fergusson, Edinburgh. Male, aged thirty-three. Caries of humerus and scapula.

(1) Disarticulation of humerus three years before. (2) Removal of scapula and outer part of clavicle. Recovery permanent. Ether was used in second operation. Healed, May 5. Recovery permanent (Rogers). Reference, *Medico-Chirurgical Transactions*, 1848, Vol. xxi, p. 309.

CASE II (1884, May 20).—Béranger, Féraud, Lorient. Male, aged twenty-four. Caries of scapula and humerus; osteomyelitis. Interscapulo-thoracic amputation: recovery. Reference, *Bulletin de Thérapeut.*, 1885, 55, année xi, pp. 490-552.

CASE III (1885, 1886, 1887, April 23).—Poncet, Paris. Female, aged twenty-six. Caries of left humerus and scapula. (1) Resection of head of humerus; (2) disarticulation of humerus; (3) removal of scapula and part of clavicle. Recovery. Reference, *Revue de Chirurgie*, Paris, 1887, Vol. vii, p. 996.

CASE IV (December, 1899).—George Ryerson Fowler. Osteomyelitis of humerus, with extensive infection of the soft parts. (1) Incision of abscess and curetting under an anæsthetic. (2) Repeated subsequent incision of pockets and curetting. (3) Pathological fracture; disarticulation at shoulder. (4) Extension of infection to and removal of part of scapula and clavicle. (5) Consecutive interscapulo-thoracic amputation. Hæmorrhage necessitating intravenous infusion during operation. Convalescence well established in a fortnight following. (Personal communication.)

Two cases were operated upon for tuberculosis.

(VIII) INTERSCAPULO-THORACIC AMPUTATION FOR TUBERCULOSIS.— TWO CASES.

CASE I (1896, April 15).—Schuyler C. Graves. Male, aged thirty-one. Tuberculosis of shoulder region. Sinuses. (1) Curetted, laid open, iodoformization, March 14, 1895; (2) curetted, July 11; (3) abscess opened, August 11; (4) excision of shoulder-joint, August 22; (5) interscapulo-thoracic amputation, two-thirds of the clavicle being removed. Axillary artery was ligated, but there was severe hæmorrhage. Sinus in flaps curetted. Intravenous infusion of one quart of hot saline solution into the radial vein. Recovery. Sinus persisted for eight months. On January 26, 1897, they were again curetted, irrigated with iodine, and packed with pure balsam of Peru. At the time of report sinus was practically healed. Reference, *Physician and Surgeon*, Detroit, 1897, Vol. xix, p. 264.

CASE II (1896, August 6).—William Bishop, New York. Male, aged fifty-two. Tuberculosis of shoulder region. Numerous sinuses. Two previous curettings. Interscapulo-thoracic amputation. No tubercle bacilli were found. Recovery. There was still a large granulating surface when reported. Reference, *The Hahnemannian Monthly*, Philadelphia, 1897, Vol. xxxii, pp. 43-48.

(IX) INTERSCAPULO-THORACIC AMPUTATION FOR INJURIES.—
TWENTY-SIX CASES.

The historic case which first showed surgeons the possibility of safely removing the entire upper extremity was that of Samuel Wood, a miller, whose arm with the scapula attached was torn from his body by the end of a rope becoming wound about his arm, the other end being entangled in the cogs of his mill. This accident occurred in 1737. The wound bled but little. The arteries and nerves, which the great force had drawn out from the arm, were placed in the wound and a dressing applied. Next day the case came under Mr. Ferne's care, at St. Thomas's Hospital. The dressings were not removed for several days. As there was sufficient skin to cover the wound, it healed quickly. Reference, "The Anatomy of the Human Body," by W. Cheselden, 7th Ed, 1750, Tab. XXXVIII, p. 321.

CASE I (1808).—Ralph Cumings, Antigua, E. I. Male, aged twenty-one. Gunshot injury. Interscapulo-thoracic amputation: recovery. Reference, *London Medical and Surgical Journal*, 1830, p. 81.

CASE II (1838, December 31).—Gaëtani Bey, Cairo. Male, aged fourteen. Explosion of a cannon. Shoulder crushed. Interscapulo-thoracic amputation (outer part of clavicle): recovery in two months. Suppuration without other complications. Reference, Omodei, *Annali Univers*, Vol. xcvi, 1841, S. 5; also *Medical and Surgical Journal*, 1842, p. 338.

CASE III (1838).—Larry. Male, aged fourteen. Gunshot comminution. Interscapulo-thoracic amputation; recovery. A castration was also done in this case. Reference, *American Journal*, 1868, Vol. lvi, p. 368; also "Résumé of Capital Surgical Operations," by Dr. C. B. Günther, Leipsic, 1861, p. 36.

CASE IV (1842).—Cooper, British Guiana. Machine injury (tore away arm and two-thirds of the scapula). Interscapulo-thoracic amputation (one-third of clavicle and rest of scapula): recovery. Reference, *American Journal*, 1868, Vol. lvi, p. 368.

CASE V (1845).—Winslow Lewis, Boston. Male. Comminuted fracture. Machinery accident. Interscapulo-thoracic amputation. Death soon after the operation from shock. There were, in addition, other severe injuries. Reference, *American Journal*, 1868, N. S. 56, p. 368.

CASE VI (1855, June 21).—Pirondi, Marseille. Male. Crushing of the shoulder. Interscapulo-thoracic amputation (two-thirds of clavicle). Death from hæmorrhage from laceration of the lung. Ligation of axillary artery. Reference, *Revue médicale de Chirurgie de Paris*; also von Brokhere, "Geschichte und Casuistik der Exstirpation des Schulterblattes," Dissertation, Berlin, 1869.

CASE VII (1856, August 26).—Parise, Lille. Male, aged sixteen and one-half months. Crushing of right shoulder and arm. Machinery accident. Interscapulo-thoracic amputation (one-half of clavicle): recovery. Preliminary ligation of subclavian artery and vein. Regeneration of scapula. In a drunken frenzy committed suicide in 1885. Reference, Communicated by the operator to Berger.

CASE VIII (1860, December 17).—Niepce, Avellard. Male, aged thirty-two. Comminuted fracture of the left clavicle, scapula, and humerus. Machinery accident. Interscapulo-thoracic amputation: recovery. Reference, *Bulletin de l'Académie de Médecine*, 1864-1865, Vol. xxx, p. 723.

CASE IX (1864, December).—Vincent Jackson, Wolverhampton. Male, aged thirty-five. Comminuted fracture of the right arm and forearm, also the scapula. Accident. Disarticulation of arm, removal of pieces of scapula. Death from shock after several hours. Reference, *British Medical Journal*, 1869, Vol. ii, N. S., p. 322.

CASE X (1869?).—Parise, Lille. Male, aged fourteen. Crushing of left arm and shoulder. Machinery accident. Interscapulo-thoracic amputation (one-half of the clavicle). Death in twelve days. Preliminary ligation of subclavian artery. Death from infection (?). Autopsy showed fracture of fifth and sixth cervical vertebræ, which had not been diagnosed. Reference, Communication of the operator to Berger.

CASE XI (1869).—Parise, Lille. Male, aged thirty-five. Crushing of left arm and shoulder. Machinery accident. Interscapulo-

thoracic amputation (one-half of the clavicle and most of the scapula). Death on eighth day. Traumatic pneumonia. Fracture of ribs with puncture of lung. Fracture of fifth cervical vertebræ. Reference, Communication of the operator to Berger.

CASE XII (1869, March 27).—Patrick Heron Watson, Edinburgh. Male, aged thirteen. Tearing away of part of the arm. Deltoid, axillary, pectoral, clavicular, and scapular region involved in the injury. Machinery accident. Interscapulo-thoracic amputation (part of the clavicle; only two ounces of blood were lost): recovery in seventy-four days. Twenty arteries ligated. Carbolic dressing. Suppuration. Later, zinc dressing. Wire sutures. Reference, *Edinburgh Medical Journal*, 1869, Vol. xv, Part i, p. 124.

CASE XIII (1870, September 14).—J. J. Charles, Belfast. Male, aged ten. Avulsion of the right arm and the scapula from the clavicle. Machinery accident. Interscapulo-thoracic amputation (part of clavicle): recovery. Chloroform. Carbolic dressing. Reference, *Lancet*, 1872, Vol. i, p. 216, February 17.

CASE XIV (1873, April 28).—Jessop. Male, aged fourteen. Comminuted fracture and avulsion of the humerus. Machinery accident. Interscapulo-thoracic amputation (one-third of the clavicle): recovery in twenty days. Air in subclavian vein. Skin-grafting. Reference, *British Medical Journal*, 1874, January 3, Vol. i, p. 12.

CASE XV (1876, December 10; 1877, January 26).—F. Gundrum. Male, youth. Gunshot injury of subclavian artery and soft parts, also shoulder-joint. Gangrene of arm and forearm and anterior part of shoulder. (1) Amputation through the humerus four or five inches from the head of the bone; (2) caries of humerus, one-half inch of clavicle supra- and infraspinous fossæ. Interscapulo-thoracic amputation (one and one-third inches of the clavicle): recovery. Considerable new bone-formation within eighteen months from the periosteum that was peeled from lower angle, superior angle, and inner border of the scapula. Reference, *American Journal*, 1878, Vol. lxxvi, p. 98.

CASE XVI (1879).—Weinlechner. Male, aged sixteen. Machinery injury. Arm torn away. Interscapulo-thoracic amputation: recovery. Reference, *Allgemeine Wiener Medizinische Zeitung*, 1878, Vol. xxiii, p. 116.

CASE XVII.—Wheelhouse. Male, youth. Injury. Interscapulo-thoracic amputation (part of clavicle): recovery. Reference, McGill (Berger, 49).

CASE XVIII (1884).—Lewis. Male (?). Comminuted fracture.

Interscapulo-thoracic amputation: died. Reference, Berger 41, Wyeth.

CASE XIX (1884, July 4).—J. Lucas Championière, Paris. Male, aged thirty-eight. Extensive injury of arm, scapula, and clavicle. Machinery accident. Separation of clavicle. Removal of scapula and arm. Recovery. Preliminary ligation of subclavian artery and vein. Reference, *Revue de Chirurgie*, Paris, 1886, Vol. vi, p. 529.

CASE XX (1885).—Schmidt. Male, aged seven. Railroad injury. Interscapulo-thoracic amputation (two-thirds of the clavicle): recovery. Reference, *Medical Press*, Western New York, 1885-86.

CASE XXI (1886, July 24).—Gaëtano Mazzoni, Rome. Comminuted fracture of the left arm and scapula. Interscapulo-thoracic amputation (without the clavicle and part of scapula): death at the end of thirty hours. Transfusion. Stimulation. Ligation of the subclavian artery. Death from œdema of lungs and acute anæmia. Reference, Agostino Paci, "Asportazione totale e resezioni parziali della scapola," *Lo Sperimentale*, 1887, November, p. 490.

CASE XXII (1887).—Kirmisson, Paris. Male, adult. Gunshot injury of the axilla. Fracture of clavicle. Emphysema of arm. Interscapulo-thoracic amputation (one hour after injury): death. Severe hæmorrhage. Reference, *Gazette des Hôpitaux*, 1887, p. 1009; also Adelman.

CASE XXIII (1887).—Jeannel. Male, aged twenty-six. Arm bitten off above elbow by a lion. Interscapulo-thoracic amputation (two-thirds of the clavicle): died in two and one-half hours. Reference, *Bulletin et Mémoires de la Société de Chirurgie de Paris*, 1886, N. S., Vol. xiv, p. 484.

CASE XXIV (1895, May 7).—Thomas F. Chavasse. Male, aged thirty-two. Machinery accident. Forearm torn away. Axillary vessels exposed, but not torn. Brachial plexus crushed, but not severed. Skin and shoulder much torn and devitalized. Interscapulo-thoracic amputation (two-thirds of the clavicle): recovery. Reference, *ANNALS OF SURGERY*, Philadelphia, 1896, Vol. xxiv, pp. 182-187.

CASE XXV (1895).—George Ryerson Fowler. (Here fully reported.) *Amputation of Entire Upper Extremity for Extensive Burns*.—P. R., aged fifty-five years, a stableman by occupation, was admitted to the Methodist Episcopal Hospital on November 17, 1895, with the history that he was found unconscious on the floor of his stable with his clothing afire and his lantern broken beside him. There were

extensive burns of entire surface of left arm and forearm. There was bleeding from nostrils and right ear, and ecchymosis of the left eye. Temperature 97.4° F., pulse 58, respiration 24.

His arm was dressed with compresses soaked in a solution of sodium bicarbonate. The nostrils and ear were irrigated with a solution of boric acid and packed with iodoform gauze. The patient complained of great pain in the arm. On the 19th (two days after admission) the moist sodium bicarbonate dressings were changed to unguentum zinci oxidi. During the next six or seven nights the patient was delirious and the pulse became intermittent. The temperature rose on the third day to 100.6° F. On the 28th (eleven days after admission) the entire arm was found to be sloughing and foul-smelling, and for the next six days was irrigated daily with a solution of potassium permanganate, and on December 3 amputation of entire upper extremity was recommended, but refused by the patient. On December 6 consent to amputation was obtained, and on December 7 (three weeks after admission) the operation was performed. The anæsthetic used was ether and oxygen.

Operation.—A four-inch incision was made over left clavicle down to the bone, and about three inches of bone resected. The subclavian artery was exposed by blunt dissection and ligated. From the incision over the clavicle an anterior incision was made downward along the anterior surface of the chest, about four inches to the left of the median line, just beyond the burned area. The incision was carried down as far as the fourth rib, across the axilla, then to the angle of the scapula, upward over the centre of the spine of scapula, and across the shoulder to the clavicular wound. The skin and subcutaneous tissues were dissected up for some distance from the incision. The attachment of the scapular muscles to the trunk were then successively divided, and the scapula and outer fragment of the clavicle removed with the arm. The flaps were sutured with silkworm gut and absorbent dressings applied.

The patient suffered profound shock, but reacted well to generous stimulation, and made a fair recovery from the anæsthetic.

From the fourth day after admission until the thirteenth day the temperature varied between 99.1° and 100.6° F., when it rose to 101.2° . On the morning after the operation, it rose to 101.3° , falling to 100.4° in the evening. Two days after the operation the patient was very restless, and seemed to have difficulty and distress in breathing, and began to cough frequently. Early that morning the patient became delirious, and the temperature rose to 103.2° ;

pulse 145. Physical examination revealed fine crepitant râles all over the right chest at the end of inspiration, dullness on percussion all over the right lung and broncho-vesicular breathing. That afternoon the improvement in his mental condition, noted earlier in the day, changed, and he became again delirious, restless, and the temperature rose to 104° . The cough improved, but the pulse grew weaker and less frequent. The wound was dressed and found in good condition. The next morning the patient had a severe chill, lasting twenty-five minutes. He was restless, and towards morning wildly delirious. During the day his respirations became very difficult, the temperature rose to 104.6° , the pulse became very weak, finally imperceptible, and in the evening he died.

Autopsy showed right lung heavy and the lower lobe in a state of gray hepatization, which process extended into middle lobe. The upper lobe was markedly congested. The kidneys were in a state of chronic diffuse nephritis, and markedly cystic. The cause of death was found to be (1) pulmonitis; (2) chronic diffuse nephritis.

This table does not include those cases of complete avulsion of the arm and scapula which have been reported from time to time, but rather those cases in which extensive injury to the humerus, scapula, and soft parts in the neighborhood of the shoulder-joint, with, in many cases, injury of the clavicle, rendered conservation of the upper extremity an impossibility. The causative factor in the majority of these cases was accident by machinery. There are three cases of gunshot injury, with one death; one injury by explosion, which recovered; one injury by lion-bite, with death; one case from extensive burns, with death; the remainder, for the most part, machinery accidents, with death in six cases. Of the nine fatal cases the immediate cause of death is not given in one case; three died of shock shortly after the operation; two died of pneumonia (traumatic in one case), the one eight and the other three days after the operation; one of hæmorrhage from laceration of the lung; in the two remaining cases there were other severe injuries. We may then fix the mortality of interscapulo-thoracic amputation for injury at 36 per cent., or three times that for malignant disease.

PATHOLOGY OF THE LYMPHATICS OF THE PERITONEUM.

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PERITONITIS is lymphangitis. The pathology of the lymphatics of the peritoneum is a most important factor, as in the structure of the peritoneum lymphatics represent the peritoneal absorbents. On the behavior of the lymphatics of the peritoneum towards invading infections depends the life of the subject. Should the lymphatics absorb the infectious invaders as rapidly as it would water, the patient would rapidly succumb to sepsis. Hence the peritoneal exudate which obstructs the lymphatics saves the subject from rapid death. Doubtless this explains the dictum of older physicians when they announced puerperal fever with peritonitis (exudates) and puerperal fever without peritonitis (absorption). In the first case the peritoneum was attempting to defend itself with exudative barriers and blocking of the lymph-channels with the same, so as to check further absorption and save life. In the second place, the peritoneum, in meeting suddenly the virulent invaders, was insufficiently prepared with its leucocytal army to withstand the attack, and hence rapid lymphatic absorption with fatality. It may be said that the peritoneal endothelia are connective-tissue cells, and that connective-tissue cells are analogous throughout the body. Hence the original connective-tissue cell is not altered in function or structure by becoming endothelial cell. The membranous character of (endothelia) connective-tissue cells does not denote an organic independence. The endothelia are derived immediately from the general connective-tissue cells of the body. The peritoneum is a layer of flattened connective-tissue cells whose surface is not interrupted by any other or foreign elements. The peritoneum is an interstitial space,—

a fissure in the general connective-tissue masses. Hence, in regard to endothelia in function (physiology) and structure (anatomy), we are dealing with connective-tissue cells, and the pathology of such cells is similar in different portions of the body. Connective-tissue cells assume many shapes, as stellate, spindle-shaped, and flat (endothelia). The endothelia may and do share in all the morbid changes to which the interstitial connective-tissue cells are liable.

The significance of these remarks are apparent, when it is remembered that the endothelia, flattened connective-tissue cells, form the lining membrane of the peritoneal lymphatics. A factor in the active invasion of peritonitis (lymphangitis) is the gliding of one segment of the peritoneum on the other. One surface of the peritoneum actually rubs the infection into the other, and the inflammatory process spreads by friction (trauma) and contiguity, the physiologic expansion and contraction of viscera and consequent friction of opposed endothelial surfaces contribute vigorously in extension of the peritonitis or lymphangitis. Peritonitis might be appropriately termed lymphangitis. The lymphatics of the peritoneum are peculiarly liable to continuous or spreading inflammation, because they are not interrupted for large areas. The lymphatics in other areas of connective tissue are interrupted by fasciæ, muscle, bone, and other foreign elements or barriers. However, it is claimed that the peritoneal connective tissue resists pathogenic microbes more than other connective tissue. The manifest effect of lymphangitis (peritonitis) is leucocytal emigration, hyperæmia, congestion, exudation, and endothelial desquamation. After the excessive physiologic manifestation of leucocytal defence and change in fulness and calibre of vessels, the earliest phenomenon of change is evident in the endothelium. As the peritoneal lymphangitis progresses, the endothelia desquamate, and leave various sized pits. It appears that the endothelial cells are forced out of their bed by the enormous transudation. The interstitial spaces, lymph-channels, and capillaries immediately beneath the endothelial membrane are not only highly distended, but the transuded fluid aids in elevating or tearing from their beds the endothelial cells. The desquamated endo-

thelial cells and leucocytes, with other forms of cells, float about in the transudent peritoneal fluid. The gross appearance of the peritoneum subject to lymphangitis is that the membrane is hyperæmic, reddened with blood, and the capillaries are engorged with blood. The endothelial surface has lost its natural pearly or glistening, polished surface, owing to the desquamated endothelia. A grayish, soft, elastic substance lies loosely on the peritoneal surface or extends in the form of bands from one peritoneal surface to the other. If the lymphangitis is recent, considerable fluid exists, containing ragged flakes of lymph. Microscopic examination of this inflammatory product shows it to consist of coagulated albumen, cells, and nuclei. The nuclei and cell protoplasm may become separated. The detached cells continue to proliferate, producing new masses of nucleated protoplasm by division. The endothelial plate, separated from its nucleus, may be seen floating about in the peritoneal fluid. Inflammation of the lymph-vessels is chiefly caused by abnormal lymph contents. They become inflamed from adjacent fields by continuous spreading of infectious process in similar tissue. In simple lymphangitis the remarkable changes, color, rubor, tumor are situated in the tissue immediately surrounding the endothelial lymph wall; this is perilymphangitis and paralympangitis. The simplest lymph-vessels consist of an endothelial tube. The inflammation may be in the endothelia which compose the wall of the vessel. In such case the endothelia become thickened, swollen, and granular. The lighter inflammatory forms may resolve and recover, but the severe forms may become suppurative (lymphangitis purulenta). When lymphatic suppuration and abscess exist, the highly swollen lymph-vessels with slackened walls often contain lymph thrombi, which block the vessels and prevent further spread of infectious material. The contents of the vessels may be fibrinous masses, mixed with micrococci or pus collections. The contents of the vessels may infect the adjacent walls, producing thrombo-lymphangitis. A thrombus may become fragmented, whence it becomes an embolus, and may float on to various localities through the lymph-stream, not only blocking the lymph-vessels, but also infecting them. Thrombo-lymphangitis may so alter and

change the lymph-stream that it will flow in contrary directions than natural, and hence infect odd regions or regions in opposite directions to the natural lymph-current. This is either due to backing up of the lymph-channel, and thus forcing the lymph-stream backward, or the pathogenic microbes thrive and travel on the lymph-channel walls in a direction contrary to the lymph-current. A continuous lymphangitis may arise and progress in a lymphatic trunk. The process may thicken the walls and especially obliterate the vessel lumen at the valvular constrictions. Tubercular lymphangitis is apt to occur in the small lymph capillaries, because here the lymph-current is small and slow, allowing ample time for the tubercle bacillus to grow and multiply,—*e.g.*, omentum majus. The peritoneal lymph stomata absorb blood, pus, or any fluid without regard to composition. When the peritoneal lymph-vessels become attacked in any locality their destruction, on becoming obstructed by thrombi, is the method by which the general peritoneum or organism is protected. Artificial drainage in peritoneal lymphangitis is a life-saving process. Flushing in local peritoneal lymphangitis is a dangerous process, as it floats the germs or their products into new fields, where the peritoneal lymphatic mouths stand ready to absorb. In the old field of peritoneal lymphangitis the lymphatic channels become obstructed by thrombi, hence the general peritoneal lymphatics were saved by local destruction or by crippling of the lymph-vessels.

The coagulated albuminous substance found in the peritoneum in lymphangitis is an essential constituent of the inflammatory exudate. The high degree of tension, to which the lymph-channels are subject during inflammation, induces an exudation of an albuminous fluid. The fluid resembles liquor sanguinis, and it rapidly passes into a solid state, and may be termed fibrinous exudate. Fibrinous exudate implies that the fibrin of the blood exudes from the peritoneal blood-vessels. The lymph-vessel contents are derived from the blood, the fibrinous exudate, together with the liquor sanguinis, appears on the peritoneal surface, and sooner or later is transformed into a solid plastic mass of reddish-gray color. The lymphangites of the pelvic peritoneum are very apt to be circumscribed,

because of the non-absorptive character of the pelvic peritoneum. Considerable microscopic labor on the pelvic peritoneum demonstrated that it was very rich in capillary lymphatics, but poor in large lymph-trunks and stomata. The smaller lymph-vessels and capillaries of the pelvis become much more rapidly obstructed than the larger lymph-trunks of the diaphragmatic or enteronic area of the peritoneum, where larger lymph-trunks and numerous stomata exist ready for rapid absorption. The early and rapid circumscription of peritoneal lymphangitis by obstruction of the adjacent lymph-channels and stomata is what saves so many lives in pelvic peritonitis.

When a fluid is injected into the peritoneal cavity containing very virulent microbes, leucocytosis is very limited. The leucocytes appear unable to cope with the dangerous microbe. The microbes and the leucocyte-cells remain quite separate. If the microbes injected in the peritoneal cavity be of a less virulent character, they begin to adhere or stick to the leucocyte-cells, especially to the hyaline-cells. Leucocytosis is slight in comparing with virulent peritoneal microbes. The peritoneal fluid sometimes, even to sixty minutes after artificial injections of microbes, becomes free or almost free from cells,—leucopenia (Metchnikoff, Kanthack, Hardy, and Durham), because the cells, peritoneal cells, become disintegrated; the same condition occurs in the pleural cavities subsequent to injections as well as in the blood, and the process has been attributed to cell-destruction or, perhaps better, arrested in the organism. The lymphocyte-cells, however, always remain in the peritoneal fluid. The chief organ that the cells of the peritoneal fluid seek and become attached to is the mesogastrium (the omentum). This is in accord with the fact that the mesogastrium is a great peritoneal protector. In nearly all my experiments, when peritonitis or congestion arose, the most intense congestion appeared in the mesogastrium. In deaths from peritonitis, man or animal, this intense congestion of the mesogastrium is a characteristic feature. The mesogastrium in rabbits, dogs, and guinea-pigs becomes rolled up along the greater curvature of the stomach. In the larger mesogastrium of man one can detect local patches of more intense congestion in peritonitis.

The rolling up condition of the mesogastrium in peritonitis is no doubt due to two factors,—viz.: (a) the peristaltic movements of the tractus intestinalis,—in man specially the peristalsis of the enteron; (b) the sticky and adherent condition of the mesogastrium in peritonitis enables it to stick when folded by the motus peristalticus. Violent and disordered peristalsis rolls the mesogastrium without peritonitis, but, its surface being not sticky or adherent, it unrolls. The mesogastrium in peritonitis attempts to corral the hyaline-cells with their adherent microbes by picking the cells out of the peritoneal fluid and making them adhere to its sticky surface; this process makes the cells in the peritoneal fluid much less in number. Careful examination of the mesogastrium will show that it harbors microbes while the peritoneal fluid is sterile. The surface stickiness of the cells determine their “balling” and the adherence to the mesogastrium. However, if the microbe be very virulent, the stickiness of the surface of the cell will not suffice to ensnare and destroy it. Cells suspended in fluid, perhaps, cannot act so vigorously as when localized in endothelial surface. Cells cannot destroy as many microbes while suspended in fluid, as they may only meet the microbe by chance, and also the microbe is not so liable to adhere to the cells. When cells have reached the endothelial membrane (mesogastrium) they are able to be aggressive on the microbe by their own power of movement. Leucocytes apparently instinctively wander to points of peritoneal irritation. Starling has aided chiefly in placing the flow of lymph in the peritoneal cavity on a secure physical base. There appears to be a general definite relation between lymph-flow and cell-intrusion in the peritoneal space. For example, Durham states that, during the leucopenic stage, the amount of peritoneal lymph increases and decreases for several hours subsequent to the peritoneal injection. In virulent peritoneal injections the lymph-flow increases with perhaps diminished absorption until *exitus lethalis* (e.g., fifteen hours). In virulent peritoneal injections, which do not cause death, the increased flow of lymph begins to diminish after the first twenty hours, and towards the third and fourth day the lymph becomes viscid and small in quantity. In some experiments, after kill-

ing the animal, merely a moist peritoneal surface could be observed. There is little doubt in my mind, after my own numerous experiments in the peritoneal cavity, that the lymph-channels remove microbes and cells rapidly and extensively from the peritoneal cavity. This view of the lymph-channels being the chief pathway of exit from the peritoneal cavity is confirmed by Von Recklinghausen's examination of the diaphragm after fatal puerperal sepsis. He found the diaphragmatic lymphatics in the serosa intensely infected. Dr. Herbert E. Durham, in his excellent labors on the peritoneum, made observations on thirty fatal cases of peritonitis in man. He demonstrated that the glands at the crura of the diaphragm (mediastinal) are always more or less affected. They were swollen, reddened, and contained microbes. The microscopical examinations of the mediastinal glands in autopsy will disclose the kind of microbe which proved fatal to the subject. Peritoneal ascites, dropsy, is doubtless a form of peritonitis involving the peritoneal lymphatics. However, the physiologic factors of its causation are not very clear. Peritoneal ascites is simply an excessive accumulation of lymph in an interstitial space (peritoneum). The excessive accumulation of lymph in the peritoneal cavity must be attributed to the secretion of the endothelia of the lymph-vessels or that it is a filtrate under pressure. Ludwig found that an increase in capillary pressure increased the supply of lymph. Starling, in his excellent labors on peritoneal ascites, considers carefully the complicated etiology. The factors of ascites peritonei may be—

(1) Increased transudation :

- (a) increased capillary pressure ;
- (b) venous obstruction ;
- (c) plethora ;
- (d) increased permeability of the vessel walls ;
- (e) local injury by
 - mechanical irritants,
 - thermal irritants,
 - chemical irritants ;
- (f) malnutrition ;
- (g) watery condition of blood.

- (2) Diminished absorption :
- (a) by lymphatics ;
 - (b) obstruction of lymphatic trunks ;
 - (c) venous obstruction ;
 - (d) watery condition of blood ;
 - (e) concentrated transudations.

The form of dropsy, which is the simplest in pathology, is that due to venous obstruction. It would be natural to ascribe dropsy to an increased lymph-production in consequence of increased capillary pressure behind the obstruction. Experiments show that the etiologic factors are not so few and simple.

The most constant glands affected are those in the mediastinal space adjacent to the mammary vessels. The anterior mediastinum lymph-paths are the chief routes taken by the material leaving the peritoneal cavity, as any one can prove by animal experimentation or examination of their structures in humans after death from peritonitis. The lymphatics in the diaphragm of guinea-pigs and rabbits injected with Berlin blue show numerous granules. In short, the lymphatic channels and lymph-nodes leading from the peritoneum through the diaphragm and mediastinum to the thoracic duct are crowded with blue granules in those animals which were subject to peritoneal injections of Berlin blue. Durham states that in tuberculous peritonitis the glands of the anterior mediastinum are enormously enlarged and infiltrated with tubercular matter. This statement corroborates the results of my numerous experiments that the paths of exit from the peritoneal cavity are by way of the lymphatics, and that peritonitis affects chiefly the lymphatics,—in other words, peritonitic lymphangitis. If the diaphragmatic and mediastinal lymph-tracts are not conspicuously infected in lymphangitis (peritonitis), some injection of the abdomen should be made to see if the mesogastrium or some pathologic factor has not intervened to obstruct the natural way of the lymph-channels. Amply sufficient indirect lymph-routes for fatal exit may exist without the direct route of the centrum tendineum. An examination of the mediastinal lymph-channels or nodes may prove the existence of lymphan-

gitis (peritonitis) without inspection of the peritoneal cavity. Rapid death following peritoneal sections or rupture of strictures allowing large quantities of virulent material to pass into the peritoneal cavity is doubtless due to violent and overwhelming infection of diaphragmatic lymphatics. I have seen a woman die in six hours after the rupture of a pyosalpinx into the peritoneal cavity. In this case, which I post-mortemed, the enteron manifested signs of severe irritation. Since a dog's peritoneum will absorb in half an hour 10 per cent. of his body-weight, the woman had ample time in six hours to be overwhelmed with absorbed infection. Lymphangitis had not had sufficient time to develop. Lymphangitis (peritonitis) is what tends to save life by obstructing the lymph-paths and preventing absorption of infection material. Cases reported as death from shock, eight to twenty-four hours after operation, are no doubt patients overwhelmed by absorbed infecting material let loose by operation in the peritoneal cavity. It must be remembered that after death from lymphangitis (peritonitis) in the post-mortem room one is liable to observe pints of pus. In really acute cases of lymphangitis—*i.e.*, cases which have absorbed much infection—relatively few macroscopic traces remain. Lymphangitis saves life, lymph-absorption kills. The pumping action of the diaphragm determines, to a certain degree, a current towards the centrum tendineum, and hither flows whatever lies in the peritoneal cavity. Some authors believe that the leucocytes which migrate to the peritoneal cavity to protect it against invasion migrate from the blood; others state that such leucocytes migrate from the interstitial spaces. The leucocytes migrate into the peritoneal cavity fifteen minutes post-injection. A relatively few experiments in injecting Berlin blue solutions into the peritoneal cavity demonstrate the rapid employment of lymph-paths for peritoneal exit. Also the rapid forcing of the lymph-paths into service for peritoneal exit of fluids is closely connected with the participation of leucocytes. These views bring out the close relation of the cœlonic cavity (interstitial space) and the lymph-paths to the blood, on the one hand, and the blood-vessels with the cœlonic cavity on the other,—*i.e.*, blood-vessels, peritoneum, and interstitial spaces are in very intimate relations with each other.

The reason that the pelvic peritoneal inflammations (lymphangitis) are so tolerated is that they generally arise slowly, thus giving time for obstructions in the lumen of the pelvic peritoneal lymphatics to arise. Also because the lymph stomata of the pelvis are much less numerous than the stomata of the upper end of the peritoneum (diaphragm). The lymphatics of the pelvic peritoneum do not absorb so rapidly as those of the diaphragmatic peritoneum.

Besides the dangerous infective area in the peritoneum is that of the enteron, where the lymph-channels are very numerous and stomata numerous, though much less than in the centrum tendineum. The enteron is not an area of lymphangitis (peritonitis), but one of absorption. The benign area of lymphangitis (peritonitis) is that of the colon, and is explained by the limited lymph-channels and stomata. Peritoneal surgery to-day is successful and brilliant in the benign colonic area (*i.e.*, the area of the pelvic organs, appendix, stomach, gall-bladder, and kidneys), but many dismal failures still occur in the dangerous enteronic area (enteron and pancreas). In animals which recover after non-fatal doses of peritoneal injections there is a widespread peritoneal leucocytosis, and Durham asserts that such stage is followed also by the appearance of macrophages. The object of the macrophage is doubtless to invest microbes, to imprison and sterilize them, to check their movements by sticking to them. Durham thinks that the macrophage is not of hæmal origin, but produced locally, especially on the mesogastrium. Since the leucocytes and macrophages appear in such vast numbers in the peritoneum of recovering animals, it is fair to assume that they have a share in combating peritoneal infecting. Issaëff demonstrated a general principle of peritoneal immunity when, after he had injected the peritoneum with solutions of NaCl, urine, serum, etc., he was able to observe that it protected the animal against certain pathogenic microbes for a certain length of time. In short, peritoneal leucocytosis is produced. Leucocytes, macrophages, are the agents which give peritoneal immunity. But any local peritoneal irritant which produces a leucocytosis produces a general immunity for only a certain length of time. It does not produce a spe-

cific resisting power, like vaccination. In general, a local irritant on the peritoneum produces a leucocytosis,—*i.e.*, a superior microbic protecting agent. But a specific bacterial protecting agent for the peritoneum must be one which, like vaccination, will produce an indefinite immunity. In the surgery of the peritoneum—*i.e.*, in peritoneal lymphangitis—Issaëff's demonstration of a period of general increased resistance, by a local peritoneal irritant, may be of clinical value. Issaëff showed that any local peritoneal irritant would produce leucocytosis, which is the body-guard of animal life. Leucocytosis begins with intraperitoneal injections, continues until the animal recovers. The white corpuscles which migrate into the peritoneum, the leucocytes, are not the only source of new tissue, if it be formed, but may be the source of pus. It was the view of Cohnheim that the white corpuscles, the leucocytes, were the source of the new tissue. He was supported by Ziegler, Heidenheim, Senfleben, Tillman, Schack, Bizzozero, and Aufrecht. This view is opposed in part by Baumgarten, Hamilton, Weiss, Ewetzky, and Böttcher. Perhaps the majority of modern investigators oppose Cohnheim's view. Sherrington and Ballance conclude that new tissue comes from plasma-cells, which are the source of tissue-repair. Plasma-cells, a cell distinguishable from the white corpuscle of the blood, build and repair. The plasma-cell proliferates rapidly in new formations. Plastic substance, to build up, must secrete cells which will end in a fibrillar substance. Injured tissue excluded from the atmosphere seldom suppurates; it repairs itself.

It would appear that the peritoneal lymphatics decrease in size, if not in number, from fish to man. The lymphatics of the peritoneum are prominent agents in the dissemination of disease. Tuberculosis becomes widely spread through the lymphatics. According to Burdon Sanderson, there is a form of adenoid tissue in the peritoneum which, during peritoneal tuberculosis, becomes greatly proliferated into cords and nodules. Naturally the peritoneum has on it localized patches of germinating endothelium; in a state of chronic inflammation, as tubercular lymphangitis (peritonitis), these patches of germinating endothelia become very large and proliferate very

actively. Klein reports that when the material of a tubercular gland is injected into the peritoneum of a guinea-pig, germinating endothelia spring up vigorously around the stomata of the centrum tendineum and on the omentum. The experiment demonstrates that there is a current in the peritoneal cavity directed towards the diaphragm, and also that it is the stomata or lymphatics which tubercular bacilli attack. In other words, the lymphatics of the peritoneum fight its battles in disease. In lymphangitis of the peritoneum the safety of the subject lies in obstruction of their lumen or external drainage.

The share that lymphatics assume in peritonitis is important to every physician.

There is a well-recognized principle prevalent among physicians that if a subject recovers from local peritonitis or lymphangitis subsequent attacks in the same locality are passed with less danger. In the adult there exists certain localities of peritonitis which are practically constant. During the past fifteen years I have performed over 500 abdominal post-mortems, and approximately the local peritonitis or lymphangitis may be calculated as follows,—viz.:

(a) Peritonitis over the right psoas muscle, which involves the peritoneum of the appendix, cæcum, or distal end of the ileum, amounts to some 75 per cent. of subjects.

(b) Peritonitis over the left psoas muscle chiefly involving the mesosigmoid to about 80 per cent. of subjects.

(c) Lymphangitis over the levator ani muscle in females amounts to about 80 per cent. of subjects.

In female subjects the accessory factors of pelvic peritonitis due to the trauma of the levator ani are two,—viz., (a) escape of infection from the proximal end of the oviducts, and (b) the contraction and dilatation of the rectum aiding the escape and distribution of infection. (c) The lymphangitis about the gall-bladder region is 40 per cent. of subjects. (d) There is 90 per cent. of lymphangitis about the spleen of adults.

Local peritoneal lymphangitis is chiefly due to muscular trauma. The pelvic lymphangitis is partially only due to the

trauma of the psoas muscles. In the right iliac fossa the trauma of the psoas is responsible for appendicitis in the large numbers of cases. About the gall-bladder the trauma of the diaphragm, right crus of the diaphragm, and the abdominal muscles tell the story.

The spleen is traumatized, resulting in perilymphangitis, by the diaphragmatic muscle chiefly.

These local areas of lymphangitis are covered with endothelia similar to the adjacent portions of the peritoneum. However, the portions of the peritoneum over which lymphangitis has passed one or more times appear pearly white, hard, and shiny.

Careful microscopical examinations of pieces of the areas of local lymphangitis revealed the anatomic fact that the lymph-vessels were almost entirely obliterated. White connective tissue had proliferated and constricted until but few lymph-vessels were found in the field. The obliteration of the lymph-channels from the peritoneal membrane by constriction of cicatricial tissue explains why the repeated lymphangitis became less and less dangerous.

Obliterating the lymph-channels in the peritoneum left no means to transport the infectious material.

TRAUMATIC RUPTURE OF THE BILE-DUCT.

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AN exceedingly interesting case of rupture of the bile-duct, the result of indirect violence, came under observation a year ago last June. Undoubtedly accidents of this kind are exceedingly rare, if one may judge by the meagre literature on the subject to be found in text-books, medical periodicals, or other media; and when one comes to study the clinical history of this case one cannot look upon it as other than a case of extreme rarity, if it does not stand almost unique when viewed from its varied stand-points. Accordingly I make no apologies for offering a rather detailed account of it. In summing up the early history of the case I cannot do better than quote the notes of the medical attendant, Dr. G. F. Emery, of Gananoque, who kindly forwarded them to me at my request.

———, aged twenty-one, a strong, muscular, and well-developed young farmer, on the 2d day of June, 1898, while tearing down an old barn, fell with a heavy beam on his shoulder, striking his abdomen across a beam upon which he had been standing, the one on his shoulder sliding down his back and exerting its force directly opposite the anterior blow. With a little assistance he was able to walk to his home, a few rods distant. The accident occurred immediately after dinner, and when I saw him, four hours later, I found him considerably shocked, his face pale and pinched, and with a cold, clammy perspiration. He suffered much pain, which was referred to a point midway between the ninth costal cartilage on the right side and the umbilicus. Temperature 97° F.; pulse 70, full and strong.

A reddened skin over the margin of the liver in the right hypochondriac region and extending horizontally across the abdomen

marked the location of the blow in front, while a corresponding bruise posteriorly, but to the left, and extending outward in that direction, located the blow behind.

The evidences of shock had been much greater two hours before, but at the time of seeing him there were no symptoms of hæmorrhage. A hypodermic of morphia was given, and the patient made in every way as comfortable as possible.

June 3.—There was marked soreness and tenderness over the abdomen, greatest in the right hypochondriac region; temperature 99° ; pulse 74; the urine had been voided and was normal in appearance.

June 4.—Temperature 101° ; pulse 78. Considerable tympanites, and pain all over the abdomen, due to over-distention. The bowels were washed out by enemata, turpentine stupes applied and repeated, and ten-drop doses of spirits of turpentine prescribed; after second dose there were free evacuations, and with them much flatus was expelled.

June 5.—The patient was feeling much better, free from pain; temperature 99.8° ; pulse 76; tympanites moderate; the urine natural in quantity and frequency.

June 6.—The patient was much improved; tympanites gone; temperature 99° ; pulse 76; bowels moving naturally; urine normal, and patient expressing a desire to leave his bed.

As he lived a long distance from my residence, I ceased calling on him. Still with misgivings that there might be some internal injury I instructed his friends to keep me informed as to his condition. All reports were favorable until the night of June 12, when I was called to see him, and found him suffering from severe epigastric pain, and his abdomen was distended with ascitic fluid, which showed, on using the hypodermic needle, to be composed of bile and serum.

June 13.—I used the aspirator this morning and removed six quarts of yellowish-green fluid from the abdomen, and the diagnosis was accordingly made of rupture of the gall-bladder. The patient's skin was at this time showing a very slight icteric tint, and the movements were decidedly light in color. Laparotomy was advised, but the friends decided not to accept the advice at present anyway.

June 17.—Four quarts more of fluid were removed by aspiration again to-day, having the same characteristics as that removed on the 13th.

June 20.—On this day I saw the young man for the first time in consultation with Dr. Emery and witnessed him draw off with a trocar

inserted in the left iliac region four quarts more, making sixteen quarts in all. The parents were earnestly entreated to give their son the only chance for life by operation, and finally they were persuaded to remove him to the Kingston General Hospital. I may say that at this time he was going in and out of the house and expressed himself as suffering no particular inconvenience, but his general appearance was pinched and worn, and was more sallow than icteroid.

On June 22, under chloroform anæsthesia, the usual incision for operations on the gall-bladder was made, and on entering the peritoneal cavity quantities of green fluid poured out, amounting in all to something over four quarts. - The opening was enlarged and the abdominal cavity flushed out with normal salt solution. The hand was next inserted and adhesions were everywhere found to exist, the intestines being more or less adherent to each other and to the anterior abdominal wall. The anatomical relations of the organs and structures, brought into view through the large incision, were difficult to make out owing to displacements from over-distention by fluids and flatus, and to their retention in their altered positions by adhesions. The characteristic appearance also of the structures was wholly changed by most pronounced bile-staining. The hand passed up to where the under surface of the liver should be found was met by what felt like ruptured and broken-down liver tissue. After more thorough breaking up and separation of adhesions the altered anatomical relations were made out. The transverse colon was pasted against the anterior abdominal wall above the upper angle of the incision, and about opposite the lower margin of the ribs. The structure which simulated liver tissue was the transverse mesocolon, thickly studded with fat lobules and profusely stained with bile. After these had been carefully separated and drawn down, the liver was found far back and packed down against the spinal column and crura of the diaphragm, whilst its upper surface was pasted to the under surface of the vaulted diaphragm. The gall-bladder was empty, retracted, and intact; the cystic duct was also entire, but yellowish bile, now seen for the first time, kept oozing up from the back part of the liver. On passing the finger backward in the direction of the foramen of Winslow bile welled up from about it. By means of an aspirating needle and bulb-syringe air was forced into the gall-bladder, the effect of which was to cause bubbles to rise up by the side of the finger. An effort was made to locate the exact point from which the bubbles issued, but it failed. However, the method adopted, aided by reflected light, was significant of the locality of the rent, and that it probably existed

at the back of the upper part of the common bile-duct as it passes downward and to the left between the two layers of the lesser omentum. Thus satisfied as to the locality of the rent, further attempts at finding the opening, much less at closing it, seemed by all odds too hazardous an undertaking, more especially as the patient had already been under chloroform for two hours and a half, and was showing evident signs of rapidly failing powers. A funnel shaped tract down to the part corresponding to the foramen of Winslow, and to the point from which the bile oozed up, was walled off from the general peritoneal cavity by means of plain gauze, and a large drainage-tube inserted.

What the cause was which led to rupture must remain a matter for debate ; whether it was produced by the force of the blow on the gall-bladder, at this time distended with bile, and communicated, according to the law of hydrostatics, through it and along the cystic duct to its distal end, and there spent upon the posterior wall of the common bile-duct ; or whether the duct was forcibly pressed against the sharp edge of the body of an adjacent vertebra, can only be conjectured. That the rupture was a large one, and that the whole amount of bile secreted escaped into the general abdominal cavity, is proved by the amount of fluid removed, even after allowing for the ascitic fluid, which always seems to be an accompaniment of such accidents after they have existed for a few days. Specimens taken from the fluid drawn on the 20th, and at the time of operation, were examined by Dr. W. T. Connell, pathologist, and he reported as follows: "The fluid proves to be largely bile, but rather watery. There is a *small* amount of albumen, due to the usual serous effusions in such cases."

The post-operative history, taken from the bedside notes, is a very varied one, but nevertheless interesting. The bowels were moved on the third day by means of an enema, the movement being semisolid and of a *milky color*. From this on they moved fairly regular, being stimulated when necessary by a cathartic or an enema. In every case the color was reported as milky or clay-colored, until the ninth day, when it was "semisolid and yellowish." On the eleventh day the movements were again reported *white* and later *cream-color*. On the fourteenth day they were "decidedly yellow." On the twentieth day "semisolid and much darker than usual," and from that on the reports show a gradual improvement until the patient left the hospital on the twenty-eighth day, when the movements were reported "quite natural."

For the first few days he retained his nourishment well, but on the

sixth day the stomach rejected all food and continued to do so until the tenth day. During the first two days the pulse remained between 86 and 104, but on the third day it went rapidly up, hovering between 125 and 135, and remained so for several days. Nervousness, restlessness, and irritability of temper were prominent symptoms throughout, especially during the earlier periods, while progressive emaciation, accompanied by a peculiar sallow look, was plainly evident from day to day. The urine at first showed the presence of bile, but it disappeared after the fifth day. The discharge of bile from the wound was most profuse. There were no means at hand of estimating the amount, but thick, heavy dressings had to be changed quite frequently to keep the patient comfortable. There was nothing worth noticing in the temperature. It was normal at the time of operation, but there was a gradual evening rise until the twelfth day, reaching on that day 102.5° F., after which it gradually subsided.

On the fifth day the gauze was withdrawn from the wound, and the drainage-tube, surrounded with some windings of gauze, reinserted. As the wound closed in the discharge became less, so that on the tenth day there was a marked diminution in the quantity. This progressive diminution continued until the day of his discharge from the hospital, at which time there was but slight staining of the dressings and the wound would permit of the entrance of two fingers only. One month later he was reported as rapidly increasing in weight, his appetite good, the movements from the bowels natural and well formed. A few days later, when I saw him, the opening in the side was about the size of a lead-pencil and discharging a little colorless watery pus. Late in the autumn he again visited the city, having ridden fifteen miles on a bicycle. He then was a stout, healthy fellow, and the wound had quite healed.

From the extreme rarity of the literature touching upon injuries such as I have described, one must conclude that they are exceedingly rare. Waring (1897), in his work on "Diseases of the Liver and Gall-Bladder," makes but slight mention of them, and, judging from his appended bibliography, that author must have canvassed the subject pretty thoroughly. Since that date the *Index Medicus* records very little. Thirwell Thomas, F.R.C.S., reports in the *British Medical Journal*, No. 1975, a case of ruptured gall-bladder cured by incision and suture of the rent. In the report he particularly emphasizes the marked

symptoms of collapse, the extreme rapidity of the pulse, and the nature of the accident,—falling flat on the abdomen.

In the London *Lancet*, January, 1898, there is a report of "A Case of Rupture of the Common Bile-Duct," by Walter Spencer, in the service of Westminster Hospital. In the opening lines of his article he states that cases of rupture of the common bile-duct are exceedingly rare; that there are seldom any signs of inflammation from extravasated bile; that, as a rule, only a few adhesions form; that suppuration is very rare; that death usually is the result of exhaustion; and that it may not occur until many days after the injury.

The case referred to by Spencer was that of a boy who was run over by a hansom cab, the wheel passing over the upper part of the abdomen. When brought to the hospital he was collapsed and pallid, with a frequent pulse, rapid respiration, and subnormal temperature. There was no bruise apparent, no tenderness over the abdomen, and no blood or sugar in the urine. Rapid pulse and respirations, vomiting, progressive emaciation, and jaundice were the prominent symptoms until the thirteenth day, when the abdomen is reported as uniformly distended and dull on percussion. On the same day an incision was made and a pint and a half of thick bile-like fluid let out. On the eighteenth day another incision in the median line was made into a fluctuating swelling in the upper third of the abdomen, which let out a quantity of fresh bile. On the twenty-second day the urine is reported as containing bile, the stools clay-colored, with progressive emaciation and weakness. On the thirty-third day the patient died. The post mortem revealed the gall-bladder torn off near its entrance to the duodenum, and a cavity filled with bile between the stomach, liver, and lesser omentum.

A case similar to Mr. Spencer's is reported by W. H. Battle in the *Clinical Society Transactions*, Vol. xxvii, p. 144.

Dr. Miles F. Porter, in an article on "Injuries of the Gall-Duct," read before the American Association of Obstetrics and Gynæcology, probably gives the best epitome of the literature. His references show that he has been pretty well over all the works where reference might be made to the subject, including the *Index Catalogue of the Library of the Surgeon-General's Office*.

To quote briefly from the article: "Injury to the hepatic ducts is usually accompanied by injury to the liver. . . No case of rupture of the gall-bladder or gall-ducts without penetration of the abdomen is reported in *The Medical and Surgical History of the War of the Rebellion*. . . The cases reported show the most frequent cause to be forces which act in a crushing manner, such as a blow on the abdomen or the passage of a wagon-wheel over it. . . The symptoms as they occur are pain, shock, ascites, acholia, jaundice, cholæmia, peritonitis, and inanition. . . Shock is generally well marked and reaction slow. . . . Secondary shock means hæmorrhage. . . Injuries of the common duct, when they result in complete diversion of the bile from the intestines, are inevitably fatal unless by some means the diversion be overcome." Following these statements are suggestions as to the best procedures when the injury is in the common bile-duct, none of which apparently has been tested.

In the article Dr. Porter reported four cases,—one from Tillman's "Surgery," the history of which is obscure. The second from Bryant's "System of Surgery," which died in the thirty-eighth day. The post-mortem revealed rupture of the hepatic duct and the abdomen filled with olive-green fluid. The third case is that reported by Dr. Kernes in the *ANNALS OF SURGERY*, Vol. xvi, p. 393. The case was first treated by puncture, by which two litres of a brown fluid were evacuated. The distention returned rapidly, laparotomy was resorted to, and three litres of fluid evacuated. The source of the bile could not be accurately determined or the lower surface of the liver palpated on account of agglutination of intestinal loops. The peritoneal cavity was wiped out with gauze compresses and the abdominal wound closed with silk sutures. After operation the belly was swollen, with marked meteorism, vomiting, and constipation. The patient, in the further progress of his illness, passed through a double-sided pulmonary hypostasis and a right-sided pleuritis, requiring repeated aspiration, with complete cure after four weeks. The fourth is Dr. Porter's own case, which he saw thirty days after the accident. The abdomen had been aspirated on the twenty-sixth day, and a pint of

fluid removed. To quote his words: "I opened the abdomen in the midline, above the umbilicus, and let out ten pints of dark-colored bile, which was confined in an artificial cavity formed by adhesions. After the cavity was emptied bile welled up from the region of the gall-bladder. Owing to the weak condition of the patient I contented myself with the introduction of two soft rubber drains. . . The wound was closed up to the tubes with sutures. . . The patient was greatly relieved of pain by the operation, but continued to fail. . . Death occurred forty-eight days after receipt of injury. Post-mortem revealed a complete division of the bile-duct about its middle and a large subdiaphragmatic abscess."

ACTINOMYCOSIS IN MAN, WITH SPECIAL
REFERENCE TO THE CASES WHICH
HAVE BEEN OBSERVED IN
AMERICA.¹

SUPPLEMENTARY REPORT.

By JOHN RUHRÄH, M.D.,

OF BALTIMORE,

ASSOCIATE PROFESSOR OF DISEASES OF CHILDREN IN THE COLLEGE OF PHYSICIANS
AND SURGEONS.

IN the article on Actinomycosis published in the October, November, and December numbers of the ANNALS OF SURGERY the number of American cases reported to that time and noted in the article was sixty-five. Since the article was sent to the printer seven more cases have been found, making the total of American cases seventy-two. As far as I have been able to ascertain, this includes all heretofore published cases, and future collective investigations may start with November, 1899. These cases represent but a portion of the cases observed in this country; and I would again urge that those who have cases unreported will send them to me, so that some definite and valuable information may be obtained as to the number of cases and their distribution.

I am indebted to Dr. J. S. Cutler, Wauwatosa, Wis., for this heretofore unreported case.

CASE LXVI.—School-girl, ten years of age. First seen in July, 1899. Patient living in comfortable surroundings. Had been in the habit of chewing wheat grains, some of which would get into the cavity in a carious tooth. Three weeks previous had severe toothache in this tooth (first lower molar). After several days there was

¹ See ANNALS OF SURGERY, October, November, and December, 1899.

considerable swelling, and the tooth was removed by a dentist. There was no pus about the root of the tooth. Poultices were applied to the face for a week without relief from the pain. At this time was seen by Dr. Cutler, who found that there was a very hard, slightly tender swelling about the size of a hen's egg in the sub-maxillary space. This was continuous with and apparently had its origin in the inferior maxilla. The skin was not adherent to it. Five days later there was a softened point which gave the sensation of indistinct fluctuation. Under chloroform anæsthesia this was cut down upon, and under the deep fascia there was found an abscess containing about ten cubic centimetres of pus. This was light brown in color, rather tenacious, and contained in it were small lemon-yellow granules. The largest of these measured two millimetres in diameter and seemed to be composed of four or five smaller granules fused together. Microscopical examination confirmed the diagnosis. There were no clubbed ends. The streptothrix threads and spores were found. The abscess cavity led down to the bone, and there was a mass of firm granulation tissue in which were more sulphur granules. The bone was not involved. The mass was curetted away and the site swabbed with tincture of iodine. Gauze drainage was inserted. Patient was put upon ten grains of iodide of potassium three times a day. The wound healed nicely, and at time of the report, three months after the operation, the jaw on affected side is a little thickened, but the scar is firm and healthy in appearance, and there is no pain and no tenderness.

I am indebted to Dr. J. E. Walker, Hornellsville, N. Y., and Dr. Roswell Park for the report of the following heretofore unpublished case.

CASE LXVII.—The patient was a farmer who had been around cattle more or less all his life. He had trouble in the region of the larynx for several years. He had cancer pastes applied several times under the belief that the trouble was cancerous. When seen he had three sinuses exuding a thin yellowish fluid. There were several cicatrices the result of previous sinuses. The case was thought to be one of actinomycosis on its appearance, and subsequently the streptothrix actinomyctica was demonstrated microscopically. The sinuses were cleaned out and an ointment of ichthyol and mercury applied. Internally he was given iodide of potassium. At the time of the report (October, 1899) he was practically well.

CASE LXVIII.—Dr. J. E. Walker (*Memphis Lancet*, November, 1898). Patient was a dairymaid, who also worked in a cheese factory. She had for two years on the left side of the face multiple abscesses, with hypertrophy of the surrounding tissues which were so prominent as to appear pendulous. There were a number of sinuses which exuded a thin ichorous pus containing yellowish granules. The abscesses were opened and curetted, and a solution of boric acid and salicylic acid, fifteen grains each to the ounce of glycerin, applied until healing took place. Perfect recovery with but little scarring.

CASE LXIX.—Walker (*loc. cit.* Case of Drs. Brown and Chitenden, of Addison, N. Y.). Patient was a drover aged sixty-eight. Had been associated with cattle for the greater part of his life. The whole neck was involved, filling the space between the jaws and the clavicles, the greater part of the development being on the right side. Several fistulæ were discovered leading out from small suppurating cavities in the interior of the enormous growth. There were scars where old sinuses had healed. On opening the softened spots there was a discharge of a yellowish fluid which had no odor. The patient claimed to have relief whenever one of these was opened. On the right side of the pharynx there was a granular patch, from which exuded material similar to that which came from the sinuses. This was expectorated in large quantities. The maxillary bones did not appear to be involved. There was some stenosis of the larynx which rendered the respiration shallow. There were numerous spasms of the throat, which were controlled to quite an extent by a solution of boric acid and cocaine applied to the pharynx by means of an atomizer. Patient was afraid to lie down for fear of asphyxia. In the posterior part of right lung there were numerous râles with prolonged expiration. The stomach was irritable and the general condition not good. Iodide of potassium was tried but could not be retained. Patient died, and examination of the tissue verified the diagnosis of actinomycosis, the streptothrix actinomycotica being found.

CASE LXX.—Stanley P. Black, Los Angeles, Cal. (*Southern California Practitioner*, February, 1898). American, aged thirty-two. About the first of April, 1893, noticed a small nodule the size of a pea, slightly sensitive, situated about a half-inch below the lower jaw, midway between the symphysis and the left sternomastoid. This nodule enlarged slowly but steadily, and at the end of two weeks was about the size of a dime. It was then treated by unctions of camphorated oil, and later by an iodine salve, and finally by white precipitate ointment. This treatment lasted about a week, and

during this time the nodule grew quite rapidly; at the end of the third week the muscles of the left side of the neck were extensively infiltrated. The infiltration also extended around and behind the angle of the jaw and to the tissues over the inferior maxilla anterior to the masseter muscles. There was considerable difficulty in swallowing, and the jaws could not be separated more than half an inch. A most careful examination of the teeth was made by a dentist, but no cavities were found on the lower jaw. There were, however, two carious teeth on the left upper jaw. Poultices were applied to the neck, and several days later a softened spot was lanced, but no pus found. A week later a small abscess developed, and this was drained and packed and in a few days healed. In about two weeks another softened area developed. At this period reporter saw the case. The abscess was opened and about two cubic centimetres of pus escaped. In this pus, on microscopic investigation, was found the streptothrix actinomycotica. Subsequently, the old scars reopened and discharged, and numerous small abscesses developed, about a dozen in all. These were opened, washed out with hydrogen peroxide, and a wet five-per-cent. carbolic acid dressing applied to the neck. An operation was refused. He was then placed on iodide of potassium, ten grains three times a day, the dose being increased one grain each day. The induration gradually diminished, and by the end of June, 1893, when he had reached a dose of forty grains three times a day, it had practically disappeared. He has been in perfect health ever since.

CASE LXXI.—Black (*loc. cit.*). In July, 1896, patient had a miscarriage followed by septic infection. After this she suffered with aching in the sides, back, uterus, and rectum. In April, 1897, she came to Los Angeles, and a suppurating left ovary was removed. Patient made a good recovery from the operation. Six weeks later noticed tumors in the left ovarian region, and similar tumors appeared in the median line and on the left side. Tuberculosis was suspected and treatment with tuberculin tried. Last September, 1897, was seen by reporter. There were several masses extending from the left ovarian region upward and outward, in or immediately under the abdominal wall. There were also similar tumors extending upward and outward from the right ovarian region, and a suppurating sinus in the scar and median line. The uterus was enlarged and fixed. Sarcoma was suspected, and she was placed upon the erysipelas toxins. This treatment was kept up for twenty-one days, the dose being increased from one-half to seven and one-half minims. The masses diminished in size steadily and markedly. The pain attending these

injections was considerable. During this treatment several abscesses developed in the tumor mass, not, however, at the sites of the injections. The pus, as it escaped on opening these, contained small iodoform-yellow granules, in which were found the streptothrix actinomycotica. The toxins were stopped and she was placed on iodide of potassium ten grains three times a day, increasing each dose one grain a day. Under this treatment her general condition improved

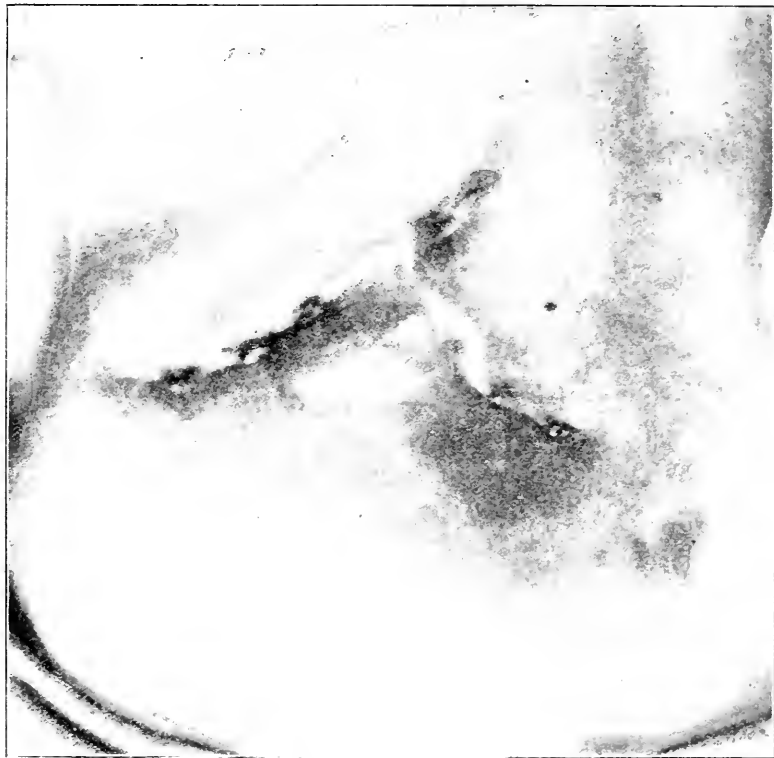


FIG. 1.—Actinomycosis of left lumbar region.

markedly. The gain in weight has been pronounced. The tumors, however, have shown no signs of diminishing in size. In fact, they have again become as large as they were before the toxins were used. The attending physician again tried the erysipelas toxins, but the pain caused by the injection caused him to desist.

CASE LXXII.—L. M. Tiffany, Baltimore. (I am indebted to Dr. Tiffany for the following heretofore unreported case.) Male,

aged thirty-six; first seen in consultation with Dr. Bosley in 1896. At that time there was a collection of pus in the right iliac fossa extending above the crest of the ilium behind. A free opening in the right lumbar region was followed by a copious evacuation of pus. Healing took place rapidly. Early in 1899 suppuration was again detected in the left lumbar region, which was freely opened. The wound did not heal completely, sinuses remaining. One month later intestinal contents appeared in the discharges of the sinuses. Addi-

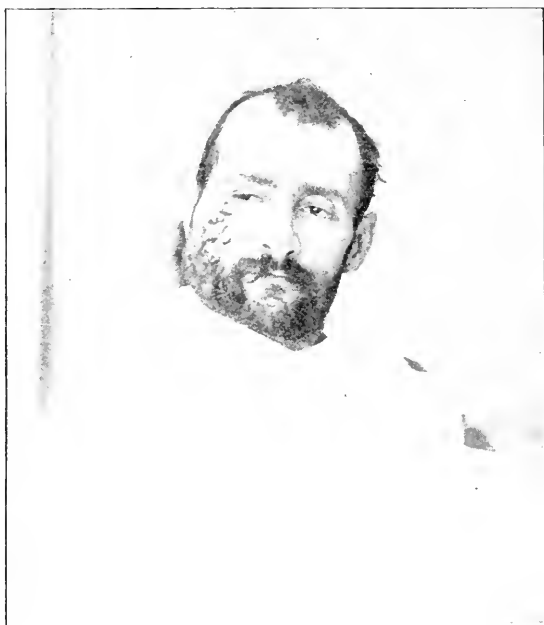


FIG. 2.—Actinomycosis of face, jaw, and orbit.

tional sinuses appeared in the neighborhood of the incision. Impairment of motion and sensation was present in both legs, but more marked on the left side. The patient died of malnutrition four months later. The streptothrix actinomycotica was demonstrated on several occasions.

The accompanying figures (1 and 2) show this and one of Dr. Tiffany's earlier cases.

ERRATA.—On page 419 of the October (1899) number there is a statement to the effect that the first case of the dis-

case to be recognized in England was that of Dr. Hartley. This is an error, as Dr. Hartley insisted that his case was one of tuberculosis. The honor belongs to Dr. T. D. Acland, who held that the case was one of actinomycosis, and proved it by his demonstrations. I am indebted to Dr. Acland for the above correction. The literature concerning this case will be found below.

ADDITIONAL LITERATURE.

Walker, J. E. : "Actinomycosis," *Memphis Lancet*, November, 1898.

Black, Stanley P. : "Actinomycosis," *Southern California Practitioner*, February, 1898.

Transactions of the Pathological Society of London, 1886, p. 346.

Medico-Chirurgical Transactions, 1886, p. 156.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 11, 1899.

The President, A. J. McCOSH, M.D., in the Chair.

FRACTURE OF THE HUMERUS, WITH PARALYSIS OF THE MUSCULO SPIRAL NERVE.

DR. B. FARQUHAR CURTIS presented a lad sixteen years old, who, in December, 1898, sustained a fracture of the humerus in its middle portion, together with a fracture of the forearm. The fractured humerus united, but complete musculo-spiral paralysis followed, and when the boy came under Dr. Curtis's observation at Bellevue Hospital, on February 1, 1899, he found a condition of complete wrist-drop, with extensive atrophy of the muscles of the forearm and hand.

On March 7 Dr. Curtis made an incision over the humerus at the point of fracture; he found the nerve continuous, but it was displaced by the fragments, which were fairly well aligned, although there was some overriding, and at the upper end of the lower fragment the nerve was caught so that it was carried up and passed at almost right angles across the back of the humerus. This had resulted in stretching the nerve, and a cicatrix had formed about it, so that it was closely bound down to the bone, and its diameter had become reduced to about one-third its normal size for a distance of about three inches.

With some difficulty the nerve was freed from the cicatricial tissue which bound it down. The wound healed by primary union, but no improvement was noticed in the functions of the arm until July. Since then steady improvement has occurred, and at the present time almost full power in the arm and hand has been regained.

Stated Meeting, October 25, 1899.

The President, A. J. McCOSH, in the Chair.

STRICTURE OF THE ŒSOPHAGUS TREATED BY GASTROSTOMY.

DR. B. FARQUHAR CURTIS presented two cases, for the description of which see ANNALS OF SURGERY, March, 1900.

DR. GEORGE WOOLSEY said that a number of years ago he had reported before the Society a case of stricture of the œsophagus of a cicatricial nature, in which he had resorted to the elastic tube. In the case he referred to no bougie could be passed beyond a point ten inches from the teeth. After opening the stomach, he introduced a small bougie with a string attached from below, and tried to cut the stricture by the "string-saw" method, but this proved only partly successful. He then introduced a large perineal drainage tube, under tension, and left it *in situ* for about a week. This tube had been introduced with some difficulty, but it came out with the greatest ease; and it was very perceptible that the elastic pressure it had exerted had materially increased the caliber of the stricture, which was then further cut by the string saw and dilated with large bougies without much trouble.

EPITHELIOMA OF THE MOUTH AND TONGUE.

DR. WILLIAM B. COLEY presented a man forty-seven years old who had already been shown by Dr. Coley at a meeting of the Society last May. The disease was first noticed in February, 1899. It began in the floor of the mouth, the tongue being only secondarily and slightly involved. At the first operation, in February, the diseased area in the floor of the mouth was removed. The glands in the neck were not enlarged. The disease rapidly recurred, and in April, 1899, a second operation was undertaken, following a preliminary tracheotomy and complete removal of the glands in the neck five days before. The second operation was a very extensive one, involving the removal of the floor of the mouth and the greater portion of the tongue. Since the second operation there has been no recurrence either locally or in the neck, and with the stump of the tongue the patient is able to make himself easily understood.

DR. ROBERT H. M. DAWBARN called attention, as perhaps being the main objection to complete extirpation of the tongue, to the danger of setting up a *schluchtpneumonie* from the inhalation of fetid saliva. This danger is minimized by keeping the patient in an inverted position for two or three weeks after such an operation, or until he becomes able once more to control his epiglottis, and hence to swallow without coughing. In this position the saliva is prevented from entering the larynx by gravity.

In dealing with inoperable growths supplied by the external carotids, Dr. Dawbarn said that the method which he devised of starving them by excising the entire length of both these arteries offers much hope, so far as he can now judge after nearly four years' time and more than a dozen instances. The operation is not especially difficult nor much worse in prognosis than a simple double ligation of the same vessels. He expressed the hope that other surgeons would also try it, at least in recurrent cases.

• DOUBLE RESECTION OF THE BOWEL (LARGE AND SMALL INTESTINE) FOR CARCINOMA OF THE CÆCUM.

DR. W. B. COLEY reported the following case:

On May 18, 1899, he was consulted by the patient, himself a physician, who gave the following history: He was forty-three years of age, and had always enjoyed good health until a year ago, when he had what he believed to be a slight attack of appendicitis. The sudden onset, pain, and local tenderness, with marked resistance in region of appendix, temperature of 102° F., associated with constipation, all pointed almost conclusively to an inflammation of the appendix. After a few days the attack subsided.

In October, 1899, a second similar attack occurred, necessitating the patient keeping in bed a few days. During this attack a small tumor could be felt; but after the attack subsided the tumor almost entirely disappeared, though a slight induration could still be felt. About this time he began to develop symptoms of indigestion, and the constipation became more troublesome. There was no loss of flesh or strength. The small painful area of induration becoming slowly larger, and the constipation becoming worse, he decided to undergo operation, and on April 6, 1899, operation was performed by Mr. Irving W. Cameron, at the Toronto General Hospital, for what was supposed to be chronic appendicitis, for up to this time there was

no reason for believing any other trouble existed. The condition found is thus described by Mr. Cameron :

“A mass the size of the terminal point of two thumbs occupied the mesocolic side of the caput coli, projecting into the lumen of the bowel, and invading the mesocolon, in which some glandular enlargement could be felt; the part which had invaded the mesocolon had contracted attachment to the mesentery of a loop of small intestine which overlay the mass and had grown through the mesentery just at its attachment to the gut (but seemingly not involving the bowel wall), and fungating on the farther side in a wart-like projection at the free border of the greater omentum, and presumably at one time in contact with the tumor, was a cauliflower-like growth, white in color and about the size of the little-finger nail, and somewhat spherical in shape. This, with attached portions of mesentery, was removed and subjected to the microscope, and showed typical columnar-celled carcinoma. Nothing else abnormal was observed.”

Not being prepared for such a serious operation as the removal of the growth would have necessitated, the wound was closed; primary union followed.

The situation was fully explained to the patient by Mr. Cameron, and, though the chances of recovery were regarded as by no means certain, a further radical operation involving a double resection of the bowel was proposed and advised. Other opinions being against operation, the patient consulted Dr. Coley as to what course to pursue. In view of the patient's good general condition and the exact knowledge already obtained as to the conditions present, he believed that there was a fair chance of surviving the double resection, and that with thorough removal of the disease there was a reasonable hope of permanent cure. At least, if recovery from operation followed, life would be much prolonged and rendered far more comfortable. Dr. William T. Bull also advised radical operation.

Physical examination at this time showed a recent linear cicatrix in the right iliac region. On palpation a small tumor about the size of a goose egg could be detected in the region of the appendix. It was but slightly tender on pressure and was not very firmly fixed. There had been very slight loss of flesh.

The bowels could be moved only by the use of powerful cathartics, and the constipation was steadily becoming more and more obstinate. Three days were spent in preparing the patient for operation, evacuating the intestinal tract as completely as possible, and rendering sterile the field of operation.

Operation was performed May 26, 1899, under chloroform anæsthesia, Dr. Bull rendering most valuable assistance.

An incision four and one-half inches long was made slightly to the inner side of the old cicatrix and nearly parallel with the rectus muscle. On opening the abdominal cavity the cæcum was found firmly held down by adhesions in the iliac fossa. In the upper and most prominent part of the cæcum was found a hard tumor involving the wall of the cæcum for a distance of three inches. A loop of small intestine was firmly adherent to the most prominent part of the cæcal tumor, and apparently already involved by the neoplasm. The condition found was, in a word, exactly as described by Mr. Cameron; hence a double resection was necessary.

The cæcum was firmly bound down in the iliac fossa by adhesions. These were first freed, permitting the cæcum and tumor to be lifted as high as the level of the external wound. The loop of adherent small intestine was then divided on either side of the tumor, and the ends united by the aid of a circular Murphy button. The ileum was next divided just above its junction with the cæcum, and then the ascending colon was cut across well beyond the limits of the growth, thus permitting the complete removal of the cæcum and adherent loop of small intestine.

The ends of the ileum and colon having been securely sutured, a lateral incision was made in the colon and ileum about two and one-half inches from the ends, and the oblong button was introduced. In both cases the buttons were reinforced by means of interrupted Lembert sutures. No enlarged glands could be found. The wound was then closed with iodoform gauze drainage. The time of operation was but little over one hour, and the patient's condition at the end was excellent. The pulse was 80, and no stimulation had been required.

He made an uninterrupted recovery. The buttons were both passed at the same time on the ninth day, and he returned to Canada on the twentieth day. He gained nearly ten pounds in weight, and when last heard from, October 27, five months later, he was in excellent health, with no evidence of return.

The case is one of considerable pathologic interest, since it furnishes additional proof of the possibility of cancer extending to other parts by contiguity.

The following is the microscopical report, made by Dr. B. H. Buxton, of the New York Memorial Hospital:

Specimen sent for examination by Dr. Coley, consisting of a por-

tion of the large intestine, to which is attached a fragment of the small intestine. The cæcum and the ascending colon for a short distance above it are the seat of a neoplasm which extends by continuity to the piece of the small intestine, the walls and mucous membrane of which are also involved. The vermiform appendix is not distinguishable in the gross specimen, but one of the sections shows mucous membrane which appears to belong to it.

Microscopically the tumor consists of alveoli, lined by a single layer of epithelial cells, lying in a matrix of connective tissue and partly also of the muscular wall of the intestine.

The alveoli are filled with mucus discharged from the epithelial cells, and in most places the lining epithelium has disappeared, leaving simply a mass of mucoid material.

The tumor is, therefore, to be classed with the malignant adenomata (*adenoma destruens*) which so frequently occur in the intestine.

TRAUMATIC RUPTURE OF THE LIVER, KIDNEY, AND LUNG.

DR. ALEXANDER B. JOHNSON presented a boy, aged seven years, who was brought by an ambulance at five o'clock in the afternoon of April 14, 1899, to the Roosevelt Hospital.

Shortly before, while playing in the street, he had been knocked down by a heavy wagon, one or more of the wheels of which had passed across the middle of his body. Upon admission he was suffering from a marked degree of shock. His skin was cold and bathed in a clammy sweat; he was pale; his pulse was rapid and weak, and his respiration superficial. He vomited occasionally small quantities of clotted blood and mucus. There were no wounds of the skin except two abrasions upon the right side of the thorax, near the clavicle. The abdomen was distended moderately, uniformly tender, and gave the signs of free fluid in the abdominal cavity. He appeared to be in a dying condition, and was stimulated by means of whiskey and strychnine hypodermically.

At 6.30 P.M. a median abdominal incision was made from the ensiform cartilage to the umbilicus. Upon opening the peritoneum considerable fluid blood, together with numerous small fragments of liver tissue, escaped. The alimentary canal was inspected throughout, no rupture was found.

Blood appeared to be flowing from between the upper surface of the right lobe of the liver and the diaphragm.

Examination of the right kidney revealed a transverse rupture of the organ, which appeared to extend nearly through its entire substance.

The peritoneum in front of the kidney was not torn, and the hæmatoma was so small as scarcely to be noticeable. The spleen and the left kidney were not injured.

The hand was introduced between the liver and the diaphragm, a ragged tear was felt in the right border of the right lobe of the liver not far from the posterior surface of the organ. The suspensory ligament of the liver was then partly divided and the anterior border of the right lobe was depressed.

It could then be seen that the right lobe of the liver had been torn away from its posterior attachment to the diaphragm, leaving the extreme right portion of the right lobe still attached. The fissure between the two portions of the liver gaped widely. The edges of the fissure were extensively pulpified. The bleeding had almost ceased. The peritoneal cavity was thoroughly flushed with hot normal salt solution, and dried with pads of gauze. The right border of the fissure in the liver was lightly packed with sterile gauze, which was led out over the upper surface of the liver through the abdominal wound. The liver was then pushed back into place and held there by a large wedge of sterile gauze pressed against its posterior border and lower surface. At this time the patient was in a condition of collapse, which was, however, relieved by an intravenous infusion of 1100 cubic centimetres of saline solution at a temperature of 118° Fah.

Upon the following day the entire right side of the patient's thorax was the seat of subcutaneous emphysema. Careful search failed to reveal a fractured rib.

He coughed and expectorated small amounts of bright fluid and clotted blood from time to time.

He remained exceedingly weak, and was nourished chiefly by nutrient enemata for the first twenty-four hours. For three days his urine contained a moderate amount of blood. His temperature was moderately elevated for several weeks, and his pulse remained rapid, not becoming as slow as 120 until the tenth day.

Considerable oozing of blood persisted for several days into the dressings, which was followed by a bright yellow, thin discharge, profuse in amount, and suggesting eggnog in appearance. This resemblance was so marked that the child believed that the eggnog which he drank escaped immediately through the wound. It was

thought possible that an opening might exist in the œsophagus at its junction with the stomach, but methyl blue solution administered by mouth did not appear in the wound.

Microscopic examination showed the discharge to consist of disintegrated liver tissue and pus, and chemical tests showed the presence of bile.

The convalescence of this patient was very slowly established. He remained delirious or semi-unconscious and apathetic for nearly one month; the large, deep cavity continued to discharge freely, and diminished in size very slowly indeed. He was not in an afebrile condition until the middle of May, or one month after the injury. It was two months before the wound of the abdomen was entirely healed. He remained in bed until the end of six weeks, after which his nutrition improved rapidly, and he left the hospital August 6, 114 days after the injury, well nourished and physically active, with a comparatively small and firm abdominal scar.

ILEO-CÆCAL INTUSSUSCEPTION, WITH COMPLETE INTESTINAL OBSTRUCTION FOR FIVE DAYS.

DR. GEORGE E. BREWER presented a patient, aged seventeen years, who was admitted to the service of Dr. Gerster, at Mount Sinai Hospital, on September 30.

Five days before admission he experienced very acute paroxysmal pain in the abdomen, accompanied by nausea, vomiting, and fever. The vomiting continued for two days, the pain and fever continuing without interruption up to the time of his admission. During this period there was no movement of the bowels, not even gas passing by the rectum, although cathartics were administered.

Upon examination shortly after his admission, the general condition of the patient seemed fair, the abdomen was moderately distended and tender over the epigastric and left iliac regions. There was a moderate amount of muscular resistance, and an indefinite sense of resistance over the lower part of the left hypochondriac and inguinal regions, suggesting a fecal accumulation. Rectal examination negative.

Small doses of calomel were ordered, to be followed by salts and a high ox-gall enema. This resulted only in an increase of the pain and a very small movement of bloody mucus and the returning enema fluid.

The following morning the mass in the left inguinal region was

more easily appreciated, and, as rectal examination revealed the presence of a large characteristic mass of invaginated intestine, an immediate operation was determined upon.

Under chloroform anæsthesia a median incision was made in the abdominal wall, which was to be enlarged until it reached from the ensiform to the pubic crest. The sigmoid, descending and distal two-thirds of the transverse colon, was found to be distended with a mass of invaginated gut, consisting of the hepatic flexure, ascending colon, cæcum, and about eighteen inches of the ileum, the point where the ileum entered the conical orifice of the colon being just below the pyloric extremity of the stomach.

All efforts to reduce the invagination by traction upon the ileum and its mesentery, or by taxis through the walls of the sigmoid or descending colon, were ineffectual without the application of a dangerous amount of force. The patient was, therefore, placed in the Trendelenburg posture, and the rectum slowly distended with a large volume of salt solution. This appeared to break up some adhesions in the lower part of the colon, as the presenting mass could then be pressed upward well into the descending colon. While this mass was firmly held by an assistant and gently pressed upward, traction was again made upon the ileum, but without success. After a number of similar efforts, it was found that, if the finger was introduced between the ileum and colon at the point where the former passed into the latter, the peritoneal adhesions could easily be broken down and a cuff of the colon turned back, thus liberating a few inches of the small intestine. After this procedure had been repeated a number of times, it was found that traction, with taxis below, through the walls of the gut, began to liberate the invaginated mass, which was finally completely reduced. The walls of the cæcum and last few inches of the ileum were greatly infiltrated, of a dark-brown color, and entirely devoid of lustre. There was great œdema of the mesentery, and in places numerous blebs filled with dark fluid. In a number of places the mesentery was torn by the traction and other necessary manipulations. These were united with catgut, together with several peritoneal tears of the cæcum and ascending colon.

As soon as the intussusception was reduced, gas and fluids were seen and heard to pass from the ileum into the colon.

The cæcum was stitched to the lower angle of the wound, as it was thought it would slough, and gauze packing placed about it. The remaining portion was united with silkworm gut, and the usual dressings applied. As the operation was long and severe a consid-

erable amount of shock followed, which was, however, relieved by appropriate treatment. The bowels were moved on the second day, and the patient recovered without an untoward symptom.

A FURTHER CONSIDERATION OF INTUSSUSCEPTION.

DR. JOHN F. ERDMANN read a paper with the above title, for which see page 180.

DR. BREWER referred to a case of intussusception in which he had made an intestinal anastomosis by the Maunsell method as advised by Dr. Erdmann in his paper. The case was one in which the obstruction had existed for six days, when the patient was brought to the City Hospital, and for two days prior to her admission there had been faecal vomiting. There was a well-marked tumor, about seven inches long, in the ileo-cæcal region, with distinct signs of intussusception. An operation was at once resorted to. The cæcum was opened by a longitudinal incision of its anterior wall, the invaginated gut delivered and cut off, the ends united by interrupted silk sutures, and the cæcal and abdominal wounds closed. The patient died a few hours later. Her condition at the time of the operation was one of extreme gravity, the pulse being 140, with a subnormal temperature. The operation only lasted a few minutes, reduction being quickly accomplished.

DR. WILLY MEYER said he had operated for intussusception in young children three times, and in all three instances a certain amount of fever and peritonitis was present. This he attributed largely to the delay caused by the temporizing methods of treatment after the diagnosis had been made. The speaker said he was positive that he had seen patients injured by the attempts made to reduce the gut by means of the injection of water, or the old-fashioned method with the help of a siphon of seltzer. The intussusception is usually of the ileo cæcal variety, and in dealing with such a condition the injection of even quarts of water will fail to produce any effect. If it really does, it will be a rare exception.

Dr. Meyer said that in operating on these delayed cases he would advocate the same course that is followed in dealing with a case of perforative appendicitis. The infected peritoneal cavity should be carefully washed out with salt solution and satisfactory drainage established, in order to overcome the inflammation of the peritoneum; otherwise, the case will invariably result fatally. The speaker said that in one case coming under his observation the intussusception of

the ileo-cæcal variety reached so low down that it could be easily felt through the rectum; reduction, as well as an ileo-rectostomy, was impossible. An artificial anus was established, but the case ended fatally. He had also operated on two cases of chronic intussusception, both had been due to intrainestinal tumor. In a boy of nine he had resected the ascending and half of the transverse colon. The intussusception had been of many weeks' standing. End-to-end anastomosis with Murphy's button; the patient recovered from the operation very nicely. Ten weeks later he died from intra-abdominal metastases. The second patient was a woman in the forties. She first presented symptoms of subacute appendicitis. Suddenly she vomited fæcal matter. Immediate abdominal section showed an intussusception at the lower end of the ileum, produced by an intra-intestinal sessile angiosarcoma. Resection of the bowel; end-to-end anastomosis with Murphy's button; recovery.

STRANGULATED FEMORAL HERNIA.

DR. DAWBARN reported the case of a man, fifty years old, who was suffering from an attack of acute intestinal obstruction which had lasted three days, when Dr. Dawbarn was called in consultation. He had pain in the epigastrium, which extended over a good part of the abdomen and gradually to the right appendical region, and was beginning to have fæcal vomiting. With his body in an inverted position it was found that his bowels were able to retain nearly a gallon of warm water; thus excluding the large gut as being the seat of the obstipation. His abdomen was quite tympanitic.

As there were no definite signs as to where the seat of the trouble lay, Dr. Dawbarn said he followed the rule of Nélaton, as formulated in 1842, in dealing with acute intestinal obstruction of some unknown part of the small intestines, and made the incision in the right inguinal region. There were no evidences of intussusception nor of volvulus, nor of internal strangulation; but the loop of the bowel brought to view was very much congested. After following this up for two or three feet an artificial anus was established at the wound. It was not followed up further on account of the tympanitic condition of the abdomen, which would have rendered impossible, without a dangerous degree of handling, the return of the intestines to the cavity. During his examination, Dr. Dawbarn said he noted a lump in the right groin, about or below Poupart's ligament. It was, perhaps, the size of a chestnut, and he took it to be a large lymph-node. It seemed not

inflamed. The family doctor alluded to this lump as having observed it, but said the patient had had neither pain nor tenderness there. No further attention was paid to it.

The patient died unrelieved four or five days after the operation, and at the autopsy, the tumor in the right groin, which he had taken for a lymph-node, proved to be a strangulated *femoral* hernia (although in a man), which could probably have been easily relieved at the time of the operation had it been recognized as such.

Dr. Dawbarn added that he recorded the case as a conscientious duty. It had taught him a bitter lesson, and hereafter, in acute intestinal obstruction of doubtful position, subjected to the knife, he would invariably examine the hernial regions from within, and this, no matter where the pain and tenderness had been seated.

Stated Meeting, November 8, 1899.

The President, A. J. McCOSH, M.D., in the Chair.

ECHINOCOCCUS CYST OF THE LIVER.

DR. PERCIVAL R. BOLTON presented a man, aged eighteen years, born in Italy, who was admitted to the hospital on September 16, 1899. Three years ago he came to this city from Italy. After residing here one year he began to suffer pain in his left chest, had occasional coughing spells, and for one day and night coughed up and also vomited a considerable amount of blood. He sweats and has coughing spells at night. Last winter he weighed 149 pounds. When admitted he weighed 123 pounds.

One year ago he began to suffer pain in his right side along free border of the ribs. Pain was greatly increased when he raised his right arm, and prevented him from working. Also felt pain in same place when defecating. Pain sometimes radiated towards back. About two months ago noticed that he was losing weight and strength. Began to suffer considerable pain through chest generally, especially when defecating. Bowels irregular; some days no movement, other days three or more. One month ago consulted Dr. Stella, who discovered a tumor in the right hypochondrium, apparently connected with the liver. Patient had not noticed it, and after learning of its presence did not observe any increase in its size.

On admission his temperature was 98° F., respiration 20, and pulse

80. He was fairly well nourished. In his right hypochondrium there was a globular mass about three inches in diameter. On deep inspiration this mass descended to about the middle of the right lumbar region, was firm in character, and percussed flat. It was apparently attached to the liver. No tenderness or pain. Urine negative.

September 20 a vertical incision was made over the tumor, beginning at a point three and one-half inches from mid-line, and extending from border of ribs downward about two and one-half inches. Peritoneum opened, and on examination a globular tumor about the size of an orange was found projecting downward from the right lobe of the liver. Tumor was regular in outline, grayish in color, and on aspiration found to contain clear, colorless fluid. The cyst walls were sutured to the upper margins of the incision, leaving a strip of the wall exposed in apex of wound. Lower portion of abdominal incision closed, peritoneum being brought well up to cyst wall.

Examination of fluid aspirated negative for hooklets. Seven days later the cyst was opened, and about six ounces of fluid obtained. Cavity was irrigated with hot-salt solution, and then packed with iodoform gauze. At night packing removed, cavity irrigated, and warm boric acid solution 1 to 25 and fresh packing inserted.

Sutures removed October 8. Wound has been dressed daily as above. Immediately after irrigation of wound was started the cyst wall was extruded. It was a whitish, glistening, laminated membrane, about six inches square.

There has been a considerable daily discharge from the wound of a shreddy white fluid, which has assumed a yellowish tinge and gradually diminished in amount. Patient allowed up on October 10.

Now up and about daily. Wound is quite small, just admitting a probe, which may be inserted about two and one-half inches. Daily irrigations with red-wash. Discharge very slight, serosanguineous in character.

For last four days boric-acid ointment injections have been used.

HÆMATOCELE FROM A RUPTURED TUBAL PREGNANCY COMPLICATED BY ACUTE PERFORATIVE APPENDICITIS.

DR. GEORGE EMERSON BREWER reported the history of a woman, aged twenty-nine years, who was admitted to the gynæcological service of the City Hospital in July last, suffering from acute abdominal pain, fever, and great physical prostration. She stated that two days

before her admission she was seized with an attack of acute pain in the lower abdomen, which was followed by great physical weakness. Her temperature on admission was about 100° F., pulse 90. An examination of the abdomen revealed the presence of a moderate amount of muscular rigidity in the hypogastric and right inguinal regions, with marked tenderness and an increased sense of resistance immediately above Poupart's ligament. Vaginal examination showed the right half of the pelvis to be occupied by a firm, tender mass, which bulged considerably into the posterior fornix.

The day following her admission she seemed better, complained of less pain and weakness, and as the temperature and pulse were declining no operative intervention was deemed advisable. She continued to improve for another twenty-four hours, during which she was first seen by the writer, who was temporarily in charge of the service during the absence of Dr. Wiggin.

The following day, however, she again experienced acute colicky pains in the lower abdomen, gradually increasing in severity and accompanied by nausea and a sharp rise of temperature. These symptoms progressed rapidly, and, as there was a marked increase in the tenderness and muscular rigidity and a progressively increasing distention, she was immediately prepared for operation.

Under chloroform anæsthesia an incision was made in the vaginal vault and a Peak-director introduced into the centre of the mass. As only a small amount of dark-colored blood escaped, the vagina was packed with gauze, the position of the patient changed, and the abdomen opened by a median incision. This revealed a ruptured right Fallopian tube, a large intraligamentous hæmatocele, and an enormous mass of firm clotted blood in the pelvic cavity extending up to and partly invading the ileo-cæcal region. In the centre of this mass the writer found an acutely inflamed appendix, with a gangrenous perforation near its tip. The appendix was amputated in the usual manner, the tube, hæmatocele, and small clots removed, the cavity irrigated with hot-salt solution, thoroughly dried, and closed with a large cigarette drain, extending from the lower angle of the wound to the pelvic floor. The pulse and temperature immediately declined, and, with one exception, neither rose above 100° F. during her convalescence.

LIGATION OF EXTERNAL ILIAC FOR FEMORAL ANEURISM THREE YEARS AFTER LIGATION OF THE FEMORAL ARTERY FOR POPLITEAL ANEURISM OF THE SAME SIDE.

DR. WILLY MEYER presented a man, thirty-eight years old, with an old history of syphilis, who was operated on for popliteal aneurism by Dr. A. G. Gerster about three years ago; the femoral artery was tied at about the middle of the thigh, and the patient was discharged cured. He returned to the hospital last April with an aneurism of the femoral artery, directly underneath Poupart's ligament, about the size of two fists. Dr. Meyer thereupon ligated the external iliac, and this was promptly followed by a disappearance of the tumor. The patient attends to his daily work, now and then he complains of some weakness in the left lower extremity.

In reply to a question as to whether he cut the artery between two ligatures or simply occluded the lumen of the vessel, Dr. Meyer replied that he had employed a single silk ligature, without cutting through the coats of the artery. The speaker called attention to the method of his cutting when operating for aneurism. It is done at two times. First the artery is tied according to Hunter. About eight or ten days later, after healing of the first wound, the aneurism is incised, emptied, and packed with gauze. The artery heals from the bottom under compression. This method should be practised in such cases only where infection from fæces or urine is not liable to take place.

THORACOPLASTY FOR BRONCHIAL FISTULA.

DR. WILLY MEYER presented a boy, nine years old, with a history of chronic bronchitis dating back five or six years. A physician who was consulted in April, 1898, pronounced the case one of sacculated empyema. Soon afterwards the boy entered a hospital, where a thoracotomy was done, the operation being followed soon by a second one with the resection of a rib. There remained a sinus which continuously discharged.

When Dr. Meyer first saw the patient in June, 1898, he injected fluid into this sinus with a view to determine the capacity of the cavity. Under violent coughing spells it was evacuated through the mouth, together with much pus, thus proving the existence of a bronchial fistula. In order to gain free access to the pus-cavity in the chest, Dr. Meyer made use of the former two parallel incisions,

which he united by a perpendicular cut through the old fistula ; this gave two lateral flaps, which were turned back, and three ribs were resected. The pulmonic pleura was tightly adherent to the costal, there was no empyema cavity. On resecting the third rib above, a granulation was found, through which the probe led into the depth and also down to the old fistula. The probe, well curved, penetrated the lung-tissue. The latter was divided down to the probe with Paquelin cautery. At the upper end an opening about the size of a small pea was found, the lumen of a bronchus into which a probe could be introduced. To this the Paquelin cautery was also applied ; the entire cavity was packed. The sinus in the chest wall closed in about two months. Now it reopens at times and a small amount of pus oozes out. In addition to this, when the boy laughs or coughs, he evacuates through the mouth a large amount of pus.

Dr. Meyer said he thought that in this case he had to deal not only with a bronchial fistula, but also with an abscess of the lung, probably due to bronchotomy. He intended to aspirate the lung and open the abscess if pus were found.

GASTROSTOMY FOR CANCEROUS STRICTURE OF THE ŒSOPHAGUS.

DR. WILLY MEYER presented a woman, forty-five years old, upon whom he had performed gastrostomy for the relief of cancerous stricture of the œsophagus on May 5. Kader's method of gastrostomy was done, with an excellent result. The woman, in addition to the food she receives through the tube, is now able to take liquid and semisolid nourishment through the mouth.

Dr. Meyer said he considered Kader's method of gastrostomy preferable to any other. In the case he presented there was not the slightest leakage about the tube, nor was there any inflammation of the skin in that region.

As regards the prognosis in a case of cancerous stricture of the œsophagus, the speaker said that in all the cases he had operated on death had occurred in less than one year after the operation, about eleven and one-half months being the extreme limit according to his experience.

EXCISION OF SCAPULA FOR SARCOMA.

DR. ARPAD G. GERSTER presented a lad, eight years of age, who was admitted to the Mount Sinai Hospital, July 1, 1899.

Three months before admission, he had complained of pain in the right shoulder. An examination at that time by the family physician revealed the presence of a slight swelling in the scapular region. The pain disappeared spontaneously, and no further attention was paid to it until six weeks before admission, when the pain returned, and upon examination the swelling was found to be markedly increased. There was at this time a rise of one degree of temperature in the evening.

On admission his general physical condition was satisfactory, no evidence of disease being found other than that in the shoulder region. Over the right infra-spinatus muscle was found a hard, oval, resisting mass, reaching from the spine of the scapula to its angle. This was firmly attached to the scapula. Skin over tumor normal in appearance and freely movable. On July 5, under chloroform anæsthesia, an exploratory incision was made by Dr. Berg, and a small fragment of the tumor removed for microscopic examination.

As the report of the pathologist was that the growth was of sarcomatous nature, on July 11 an operation for its complete removal was undertaken by Dr. Gerster. Two incisions were made, each beginning at the coracoid process of the scapula, and ending at a point just below its angle. Between these two points the incisions diverged, one passing down over the posterior and the other over the axillary border of the bone. The muscular attachments were all divided, and the entire scapula, including the subscapularis, supra- and infra-spinatus muscles, removed, with the exception of the small point of the coracoid process which gave origin to the tendons of the biceps and coraco-brachialis muscles.

The hæmorrhage was profuse, but easily controlled. The wound was closed with button and silkworm-gut sutures, a small gauze drain being left in the upper angle, which extended into the shoulder-joint.

A slight wound-infection followed, but in no way interfered with the healing of the wound, which was complete in four weeks.

WALKING APPLIANCE IN CASES OF EPIPHYSEAL SEPARATION OR FRACTURE OF THE NECK OF THE FEMUR IN YOUNG PERSONS.

DR. ROYAL WHITMAN presented a boy, fifteen years old, who, about four weeks ago, was injured while playing foot-ball, resulting in an epiphyseal separation at the right hip-joint.

Dr. Whitman said his chief object in showing the patient was to

illustrate a convenient form of walking appliance, which had been found very satisfactory at the Hospital for Ruptured and Crippled, not only in cases of epiphyseal separation, but also in cases of fracture of the neck of the femur in early life. The appliance consists essentially of a plaster-of-Paris spica bandage reaching to the knee, supplemented by a traction hip-splint. By this means the weight of the body is removed, sufficient traction is exerted to overcome its muscular spasm, and the joint is effectively splinted.

Dr. Whitman said he advised the use of this appliance during the stage of repair.

Dr. HOWARD LILIENTHAL thought that such a splint would be indicated in the very beginning, providing there was no great effusion of blood, with swelling. The plaster-of-Paris bandage kept the relationship between the pelvis and femur quite perfect, and there was extension; he saw no reason why the appliance should not be advised earlier.

FURTHER OBSERVATIONS ON DEPRESSION OF THE NECK OF THE FEMUR IN EARLY LIFE. (a) FRACTURE; (b) EPIPHYSEAL SEPARATION; (c) SIMPLE COXA VARA.

Dr. ROYAL WHITMAN read a paper with the above title, for which see page 145.

FOLLICULAR PERFORATION OF THE ILEUM.

Dr. GEORGE E. BREWER presented a specimen obtained from a woman, forty years old, who was brought to Mount Sinai Hospital about two weeks ago, suffering from a strangulated femoral hernia which had existed four days. An immediate operation was done. About seven inches of very dark intestine were found in the hernial sac, which also contained a certain amount of discolored fluid. As soon as the constriction was relieved, the color of the gut improved, and it was decided to drop it back. After twenty-four hours the patient developed symptoms of peritonitis, and died very suddenly.

Autopsy.—As soon as the abdomen was opened, free gas and also pus escaped through the incision, showing that a perforation existed. The portion of the gut which had been strangulated, although somewhat necrotic in parts, showed no perforation; but seven inches above the strangulated area there was found a distinct perforation of

the ileum; the peritoneal surface was the seat of recent adhesions, and the mucous membrane in that neighborhood was in a state of acute enteritis. Two or three distinct lesions were found.

Dr. Brewer said he was at a loss to understand the cause of the condition found above the seat of the constriction in the case he reported. He referred to the statement made in König's "Surgery" that this condition has been observed in a number of cases of strangulation of the gut, and has been attributed to the intense traction upon the mesentery, which interferes with the blood-supply; it has also been attributed to the fact that there is an accumulation of *fæces* above the seat of the constriction, which distends the gut; and this, in addition to the impaired blood-supply, brings about necrosis. König does not mention the possibility of a perforating ulcer occurring in connection with this condition.

Dr. A. B. JOHNSON said that inasmuch as solitary perforations of the ileum were quite uncommon, he desired to put such a case on record which had come under his observation a few weeks ago. The patient was a man who had been operated upon by Dr. Abbe recently for an anthrax pustule of the cheek. From this operation he apparently recovered and went home. Three weeks later, while seemingly enjoying perfect health, he was taken with a severe abdominal pain, with vomiting, which induced him to return to the hospital. The following morning, when Dr. Johnson first saw him, the abdomen was rigid, and it was evident that he had to deal with an intra-abdominal inflammation. Upon opening the abdomen he found a generalized peritonitis, and in the ileum, about two feet above the ileo-cæcal valve, was a round perforation of the entire thickness of the gut, from which a considerable amount of *fæces* and gas was escaping. The perforation was ulcerative in character. It was excised and the wound was closed. Death occurred on the following day. A specimen examined by the microscope revealed only the presence of colon bacilli and some diplococci which could not be identified. The lesions evidently had no connection with the man's previous anthrax.

Dr. WILLY MEYER said that about one year ago Professor Kocher, of Berne, had published a very complete article, with a number of beautiful illustrations, on the subject of ulcer perforations of the gut occurring above the seat of strangulation. He called these ulcerations distention-ulcers (*dehnungs-geschwüre*), and gave for their occurrence about the same explanation as Dr. Brewer had given.

CHOLELITHIASIS WITH CHOLECYSTITIS.

DR. CHARLES K. BRIDDON presented specimens obtained from a woman, aged sixty-two years, who for about four years had had some abdominal bloating, pain in the epigastric region, and constipation. Attacks would occur every third or fourth month, and would persist for three or four days or a week. She had never had a symptom pointing towards bilious colic, no jaundice, no clay-colored stools, no renal symptoms.

Two days before her admission to hospital, she began to have a dull pain in the epigastrium and some pain over the region of the gall-bladder. When the pain began, she vomited once or twice, and thinks she had a slight chill; bowels constipated. The next day she vomited again; pain about the same; bowels moved by catharsis. When seen by physician that day her temperature was 102° F., pulse 120.

On admission to hospital, 7 P.M., September 13, 1899, the patient presented for examination the following conditions: She was fairly well-nourished; face slightly anxious; no icteric hue to skin or conjunctivæ. Tongue dry and coated; heart action good but rapid; no murmurs. Pulse has some tension; arteries thickened; lungs negative. Respirations, 34. Abdomen not distended, but muscles held rather rigid over all, particularly marked on right side. There is pain on pressure in the right lumbar and hypochondriac region, the most sensitive point being two inches to the right and one inch above umbilicus. At this point is definitely felt a hard globular tumor, size not made out. It moves with respirations.

Pulse 126, temperature 103° F. Patient prepared locally for operation, which was performed two hours after admission.

Upon opening the abdomen, an engorged and tense gall-bladder of mahogany liver-color, was exposed. The surrounding peritoneal cavity was well protected with compresses, and an exploring-needle inserted into cavity of gall-bladder, which withdrew a copper-colored, odorless fluid. The gall-bladder was then opened by an incision three-quarters of an inch long. This evacuated about six ounces of bile-stained fluid containing some pus; a finger introduced into bladder detected several calculi. These were removed by spoon and forceps, the largest calculus weighing 11.1 grammes. The cavity of the bladder was then cleansed with sponges. The wound was partly closed below with drainage into peritoneal cavity. The edges of the

gall-bladder being sutured to parietal peritoneum with chromic gut, a gauze drain was left in bladder.

Convalescence was uneventful. The day after operation, patient's temperature was 101° F., and subsided gradually, reaching normal on the sixth day. Pulse proportionate. Bowels moved regularly after the third day, and were of good color.

Wound dressed on third day. Peritoneal wound clean, no bile had escaped from bladder; on the seventh day peritoneal wound was allowed to close; much bile escaping from gall-bladder into wound. Nineteen days after operation, patient was up, wound nearly healed. Patient discharged October 6, twenty-four days after operation; wound entirely closed, except for a very slight biliary fistula, which discharged about one-half drachm of bile in twenty-four hours.

TRANSACTIONS OF THE SECTION ON GENERAL SURGERY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA.

Stated Meeting, April 14, 1899.

EDWARD MARTIN, M.D., in the Chair.

SURGICAL USES OF THE X-RAY.

LANTERN slides illustrating the value of the X-ray in locating foreign bodies were shown by DR. A. C. BUCKLEY.

DR. F. T. STEWART presented two slides showing greenstick fractures (Figs. 1 and 2). Fig. 1 is that of a greenstick fracture of the femur in a child two and one-half years of age. The line of fracture, unlike most greenstick fractures, looks as if it had been

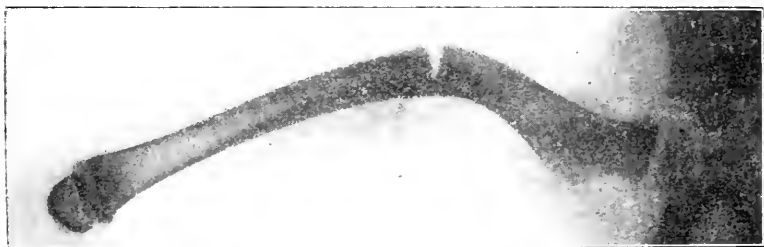


FIG. 1.—Greenstick fracture of the femur (Pennsylvania Hospital).

made with an osteotome. In the typical greenstick fracture the line of cleavage resembles a T or Y, the bony tissue parting first on the convex side of the bending bone, then splitting longitudinally upward and downward. This is more clearly shown in Fig. 2, an incomplete fracture of the ulna with a curving of the radius. This patient was also two and one-half years of age. Both these fractures were completed by the surgeon, the bones straightened, and splints adjusted.

DR. CHARLES LEONARD presented slides showing renal calculi, and read a paper on the subject, for which see page 163.

DR. WILLIAM W. KEEN showed the calculus which he had removed from the case in which the calculus had been demonstrated by the skiagraph of Dr. Leonard. In continuation, he said :

There are two points of view from which we can regard the question of calculus: first, that of diagnosis; and, second, that of treatment. In the matter of diagnosis, it replaces an uncertain guess by positive diagnosis. It has happened to me three times to cut down on a kidney which I supposed contained calculi, to open the kidney, and to find no calculus. Hereafter I shall not make such a surgical blunder,—a blunder which was pardonable a few years ago, before we had the use of the X-rays, but is now inexcusable in surgical centres with X-ray apparatus.

The very remarkable slide that Dr. Leonard showed of one large



FIG. 2.—Greenstick fracture of the bones of the forearm (Pennsylvania Hospital, F. T. Stewart).

calculus and two smaller ones is an illustration of the ability of the skiagrapher at the present time to show not only that the calculus is present, but the exact number and location of calculi, so that when we have removed one calculus it will not be supposed that we have removed all that are present; but we can refer to our picture and determine whether there are others present.

We are not only able to diagnosticate the presence of calculi, but the exact position can be determined. In other words, the kidney having been exposed, and practically in our hands, we can fix the level in the kidney at which the stone exists by referring to the spines of the lumbar vertebræ, as shown in the skiagraph. In this manner we are saved unnecessary mutilation of a kidney, and of making a much larger opening than is necessary, involving the question of more

hæmorrhage. As hæmorrhage is always a serious matter, we should limit ourselves to as small an incision as practicable.

One other word as to stone in the bladder. Dr. A. H. Cordier showed to me some remarkable pictures taken, not of actual pathological specimens, but of stones purposely introduced into the bladder, by a method which is very suggestive. He took narrow slides, somewhat of the shape of microscopic slides, covered with paper or other material for the purpose of preventing any possible absorption of poisonous matter, and introduced this narrow slide into the vagina in women, or into the rectum in men. Then placing the X-ray tube

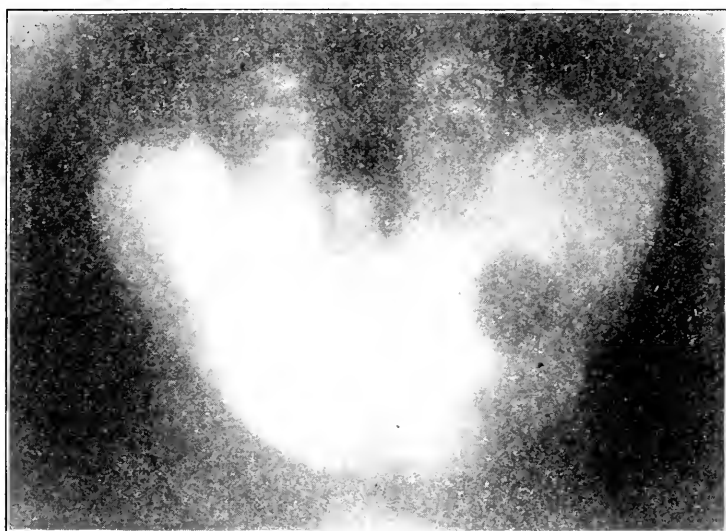


FIG. 3.—Dr. J. William White's case of vesical calculus.

above the pelvis, he was able to skiagraph absolutely and with the utmost correctness a stone in the bladder in either sex.

So we are not dependent now on the possibility of taking the skiagraph through bones, but can take them independently of the bones by the exposure of small narrow plates. The X-ray makes us certain of the presence of the stone and of its location. Even though encysted, we may be sure of its presence, though we may have failed to find it at previous attempts.

One other important point is that it requires an expert to interpret these pictures. I am sure that many who are not such experts

would not be able to define the outline of the kidney until it was pointed out, and in some of the pictures of calculi would not be able to be sure that they were calculi. Especially do I call attention to this need of expert interpretation of X-ray pictures in connection with medico-legal cases. In many cases an X-ray picture shown to an untutored jury is not only throwing away time, but serious damage may be done by their misunderstanding it.

SKIAGRAPY IN ORTHOPÆDIC SURGERY.

DR. GWILYM G. DAVIS said that while the extravagant hopes raised by the discovery of the marvellous properties of the Röntgen rays have in many cases failed of realization, still, in the field of orthopædic surgery, their value has been amply demonstrated, even though as yet we have only begun to unfold their benefits. Orthopædics treats of the bones and joints, and it is in demonstrating the conditions of these structures that skiagraphy has shown its greatest efficiency. It will suffice to point out a few of the ways in which it can be utilized. Changes in the shape of the bones are most clearly shown. We are enabled not only to get a perfect picture of the normal bones *in situ*, but also of bones more or less distorted or diseased. Thus, in rickets, in which the bones assume the most varied shapes, we are able to get a most accurate outline of them, no matter how much they are concealed by the soft parts. In cases of bow-legs and knock-knees, we are able to see the exact factors which produce the distortion, and decide as to the best point to attack them. Our knowledge of that recently-described affection, coxa vara, is largely due to the information obtained as to the condition and position of the head and neck of the femur of the affected limb,—knowledge, too, which has had a direct bearing on the therapeutic procedures employed for its relief.

Skiagraphy has demonstrated quite satisfactorily various deformities of the ribs, particularly cases of cervical ribs, and has cleared up the diagnosis of obscure swellings in that region. Not only have the deformities due to disease been made visible, but also those due to injury. The general surgeon sees fractures in their recent state, but it is to the orthopædic surgeon that the deformities arising therefrom apply for relief. Here the utility of skiagraphy is evident. It shows the exact site and often the essential nature of the deformity, and renders clear the course to be taken to relieve it. In cases of congenital bony defects the exact extent of the lesion is rendered visible, and one is able to see how much of the normal bone is lacking.

By skiagraphy we are also enabled to ascertain the relative position of the bones, particularly those entering into the formation of the joints. By its means, Lovett and Cotton were able to demonstrate the altered positions assumed by the bones in standing, in cases of painful pronation of the foot.

In congenital luxations of the hip, we are enabled to see the actual relation of the head of the femur to the acetabulum. It tells us to what extent it is present, when it is out of joint, and when it is again in place. Its use in this affection is almost imperative.

In cases of luxation of bones, its demonstration of the lesion is perfect. By its means, on one occasion, I was enabled to show that a painful affection of one of the toes of the foot was due to a displaced phalanx, and afterwards to again demonstrate its replacement. In ankylosis, it enables us to distinguish between a bony and fibrous bond of union, and regulate our treatment accordingly. In cases of exostosis, we are not only enabled to see their shape, but also their mode of attachment. In diseases of the bones entering into the formation of joints, their extent is often well defined. In coxalgia this is particularly the case, the loss of the head of the bone from caries being made quite evident. The same is true to a less extent, perhaps, when the disease attacks other joints. In club-foot, the distortion of the bones is made manifest, and one of the most valuable and suggestive of its revelations is the small part played by the true calcified bone, and the large part played by simple cartilaginous and fibrous changes, thus teaching us that operations on the bones are only essential comparatively late in life. It is most satisfactory to be able to practically see, after an operation for deformity from fracture, that the bones have been correctly replaced. Also in resection of the knee-joint, a skiagraph will show whether or not the sawn ends of the bones have remained in proper position. Subsequent displacements may be recognized, and therefore capable of being rectified.

Inasmuch as the larger part of orthopædic affections involves the extremities, skiagraphy has proven a most valuable aid. In affections of the spinal column, while certain results have been obtained particularly in the cervical region, they have not been so valuable as have those of the extremities. So essential has the use of the method become in orthopædic surgery, not only for diagnosis, but, above all, for treatment, that an X-ray outfit has now been installed in most of the orthopædic hospitals, and we may confidently look for valuable additions to our knowledge in the near future.

REVIEWS OF BOOKS.

THE SURGICAL DISEASES OF THE GENITO URINARY TRACT. BY G. FRANK LYDSTON, M.D. The F. A. Davis Company, 1899.

A perusal of this work impresses one that the author is, firstly, enthusiastically devoted to his subject, and, secondly, that he has an eminently practical grasp of the same. The book is in line with the most advanced teaching. The only deviation from genito-urinary orthodoxy for which the author can be arraigned lies in a disparagement of the importance and value of the discoveries of the etiological relations of certain micro-organisms to certain diseases. In many instances he prefers to speak of filth rather than of its specific bacteria. These heresies are by no means fatal, for the author always comes out, finally, at the same scientific goal as that reached by the closest conformist to the faith in the personality of the bacterians. His eminently practical views are broadly and judiciously founded; and indeed, when deliberately considered, are in line with the most progressive scientific thought. He is suspicious of many of the diagnoses of gonococcic infection, and claims that, according to those who consider the specificity of the gonococcus as absolutely established, the germ has as yet practically no standing in court, as will be found the first time an attempt is made to back up expert testimony with the written authority. The opinions of these authorities serve to strengthen the author's views that the specific microbe of gonorrhœa is a derivative of some primarily innocuous germ and a purely evolutionary product. He is of the opinion that the contrast between clinic and laboratory is not yet finished, nor are the views of each reconciled.

“The best method for the abortion of urethritis is prolonged

and systematic irrigation of the anterior urethra with solution of potassium permanganate 1 in 5000 to 1 in 3000." "The average patient who has stricture resulting from a gonorrhœa that has been treated by injections, no matter how skilfully and beneficially, attributes his condition to the treatment. Should he consult a surgeon of anti-injection proclivities, his erroneous ideas are confirmed, much to the detriment of the reputation of his former surgeon, who, perhaps, treated the patient scientifically and conservatively." This is a sad criticism of the ethical spirit of medical men. We hope that the author has laid an unjust impeachment upon his professional colleagues.

"Very hard, cartilaginous, deep strictures of long standing, whether complicated or not, require perineal section, especially in cases attended by serious bladder complications." With regard to ordinary penile strictures, the author is an advocate of gradual dilatation. We are somewhat surprised to find sulphurated lime introduced into surgery for its anti-suppurative properties. The author gives a page to the consideration of this drug, particularly in connection with its use in venereal adenitis. He seems to have just grounds for his faith. It may be a valuable agent; who knows?

The author observes that many patients object to having supuration checked in the case of bubo, believing that it is detrimental to have the poison "scattered." Concerning such ignorant persons, he says, "when we meet with a person of this kind, however, we should do our utmost to promote suppuration, hoping that the resulting scar will be sufficiently large and unsightly to give satisfaction." This is not in keeping with the high general character of the book, which abounds everywhere with the loftier sentiment, and if there is any sentence which we would have the author omit, it is this.

"Colles's law, so called, that an hereditarily-syphilitic infant cannot infect its mother," the author ingeniously says, "depends simply upon the fact that the mother already has, or has had, syphilis." The author speaks in no uncertain tone upon the subject of the moral and ethical side of sexual questions. His views are radical and practical. All derangements of the sexual functions are, properly, the subjects for earnest scientific study.

The reviewer believes that the diseases of the sexual organs are quite as worthy of intelligent study and considerate treatment as affections of other organs, but he takes issue with the author when he says that "the sexual organs and functions are the noblest attributes of man."

Concerning the prostate, he says: "The surgery of the prostate has never been given a fair opportunity for development. The cases submitted to us for operation are usually those in which not only have all other measures of treatment failed, but complicating conditions have arisen that seriously enhance the dangers of operation. Operative statistics based upon the results obtained in the class of patients upon whom we at present have the most frequent opportunities of operating are practically worthless, excepting in so far as they bear upon a radical cure or recovery from the operation in a particular class of desperate cases. With a proper understanding of the limitations and indications of the operation, and a judicious selection of cases, there is no reason why early operation upon the prostate should not yield excellent results. In the opinion of the author, radical operations upon the prostate should be comparatively safe if performed prior to the development of septic complications or renal disease; *i.e.*, if performed at a comparatively early period after the development of urinary obstruction." This is true. The author's classification and analysis of *prostatiques* is excellent. "It is to be hoped that the general practitioner will, ere long, become more appreciative of the advantages of early surgical interference in prostatic disease. There is no reason why such cases should be allowed to suffer indescribable torture, to die, finally, as sacrificial offerings to a conservatism that conserves nothing but a dangerous routine, let alone policy, which has no place in surgery." This also is true. In the matter of operations for stone in the bladder, we are inclined to think that the author is a little out of the line of the general surgical tendency, and that he overestimates the value of lithotrixy and litholapaxy in comparison with cystotomy. For ablation of the scrotum, the author countenances, and, indeed, illustrates, the operation with Horteloup's clamp. He also gives the picture of the clamp of one Henry for scrotal resection. The surgery of the kidney is

dealt with but briefly. An appendix is added, in which he gives the bibliography of his own writings, particularly those which have been referred to in the text.

This is a book of over a thousand pages. It does the author and publishers great credit. It is dedicated to the first of American genito-urinary surgeons, Fessenden N. Otis, many of whose teachings the author wisely perpetuates.

JAMES P. WARBASSE.

A TEXT-BOOK ON PRACTICAL OBSTETRICS. By EGBERT H. GRANDIN, M.D. With the Collaboration of GEORGE W. JARMAN, M.D. Second Edition, Revised and Enlarged. Illustrated; 8vo. Pages xiv-461. Philadelphia: The F. A. Davis Company.

So many excellent works on obstetrics have appeared in the last decade that the need for still another volume on this subject may be fairly considered a matter of doubt. That this is the second edition would, however, indicate that some have found it useful.

The authors presuppose a knowledge of anatomy, physiology, embryology, and even of pathology. That the first two may be taken for granted is reasonable; but with the embryotic teaching accorded to the others, even in our most advanced medical schools, and with the entire absence of such instruction in the college days of most active practitioners, the omission of the latter topics is a doubtful advantage. Pregnancy, Labor, The Puerperal State, and Obstetric Surgery are the four chief divisions of the book.

The observations and directions for guidance during pregnancy are especially good, and the information given as to palpation and auscultation, illustrated by excellent photographs, are also of especial merit. Since L. O. A. is the standard type of nomenclature at the present time, and is adopted by the authors themselves, it should be adhered to throughout, instead of using the inverted order of M. L. A. and S. L. A., which follow.

In the description of the mechanism of labor, the text is supplemented by a beautiful series of photographs of the actual child in utero in each of the various positions, and the result is by far the best explanation of this little understood subject that is to be found in American text-books.

Up to the chapter devoted to the management of normal labor there is much to commend and little to criticise; unfortunately, from this point onward the reverse is the case. The illustrations in this chapter are, many of them, for the purpose of placing in evidence the likeness of the various doctors concerned, for they do little else, and the ones devoted to catheterization and to the dressing of the cord serve no other purpose. It is to be hoped that no one having occasion to apply an abdominal binder will think of the one pictured in this book as a worthy model to follow; a more slip shod application it would be hard to find. A draw-sheet is not merely a "folded pad on which the patient lies," nor is any physician obliged to do without a douche-pan, even in the homes of the very poor, unless he so desires. To state that obstetric anæsthesia involves *no* risk is a dangerous and unsound doctrine to teach; nor is it good sense to advocate the insertion of the entire hand into the vagina for the mere purpose of diagnosis; such a procedure is apt to do damage and is quite unnecessary.

Few surgeons would admit that a saline infusion can only be given when elaborate apparatus is at hand; a canula can always be carried, and a clean fountain syringe is nearly always available. Finally, if, as is shown in the illustrations of an alleged practical management of a case of normal labor, it is necessary to have five able-bodied men—very able-bodied, indeed, as regards two of them—assist in the expression of the placenta and in the ligation of the cord, the private practitioner would do well to give up medicine as a profession and turn his attention to something that he can do well alone.

The last portion of the volume is devoted to obstetric surgery. Many criticisms could be made were it worth while; but let it suffice to say that these chapters are not representative of the best obstetrics of the day, and most of the subjects treated can be found better described in other works.

JOHN TELLER FULTON.

EFFECTS OF INTRACEREBRAL AND SUBCUTANE-
OUS ADMINISTRATION OF TETANIC ANTI-
TOXIN IN TETANUS AS OBSERVED
IN NINE CASES.¹

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HOSPITAL,

THE true value of the serum treatment of tetanus cannot be fairly established without the careful consideration of many cases candidly discussed.

The disease, as generally considered by surgeons, is rightly regarded as one of the most formidable maladies one has to treat, yet occasional writers rate the general mortality as low as 50 per cent. Under the best forms of treatment most writers, however, regard 80 per cent. as more nearly correct.

My own experience up to the last two years has been limited to six cases, extending over twenty-five years; of these only one recovered. During the last two summers nine cases have presented themselves for treatment at Roosevelt Hospital, under my care, and were subjected to serum treatment, with varying results, the reports and conclusions as to which I will briefly report.

I confess to have been rather sceptical as to the value of the subcutaneous method of serum treatment from reported cases, but was impressed by the novelty and promise of the treatment by intracerebral injections as outlined by Roux and Borrel. It is decidedly in the line of progress that our first promise of help should come from the laboratory; and the experimental use of injections into the brain in guinea-pigs,

¹ Read before the New York Surgical Society, November 22, 1899.

whereby Roux succeeded in saving thirty-five successive tetanized pigs out of forty-five thus injected, is an ample warrant for the employment of this method in the human subject. It is an eminent improvement over the subcutaneous method, which in the laboratory saved only two out of seventeen tetanized guinea-pigs.

In Roux and Borrel's article (*Annals of Pasteur Institute*, April, 1898) the position is taken that the poison of tetanus is fixed in the nerve tissue, notably in the brain-cells, which have a special affinity for the toxine, as in hydrophobia. The only satisfactory explanation of the better action of antitoxin by cerebral injection is based on these facts: that passive immunity in an animal which has received antitetanic serum injections, enables it to resist many times the fatal dose of toxin; it is thus resistant because of the circulating antitoxin in the blood; in a victim of traumatic tetanus, the toxine has already been taken out of the blood by the nerve-cells, and the injection of the antitoxin into the circulation meets and destroys merely that portion of the poison which is still in the blood, whilst the intracerebral injection infiltrates the cerebral tissue, and is believed to bring about an alterative action on the cells proper.

A few cases only have been reported of cerebral injection. a number insufficient to draw a final conclusion as to its value. Dr. Rambaux, of this city, collected nine cases from foreign journals reported up to December, 1899. (See *New York Medical Journal*, December 17, 1898.) I am able to add nine cases from my recent personal experience.

CASE I.—A. B., aged twenty-two years, was shot, July 3, 1898, in the left thigh. When he came to Roosevelt Hospital on the following day there was a wound of entrance but none of exit. Probing and radiograph failed to show a bullet. He left the hospital with a small sinus, to be treated in the Out-Patient Department. Sixteen days after the injury, July 19, he began to have dysphagia, trismus, and rapidly developing muscular stiffness. The wound became hardened and brawny. On the third day there developed convulsive spasms, opisthotonos, risus sardonius, and general tonic spasms. The patient was brought back to the hospital with a temperature of 99.2° F., pulse 104. The wound was excised, a continuous bichloride dressing

applied, and twenty cubic centimetres of Board of Health antitetanic serum were subcutaneously administered. In addition, he received forty grammes of chloral, thirty grammes of bromide, and one-quarter grain of morphine.

The general spasms were somewhat lessened; he swallowed better, and had but few spasms during the next day. Then the wound was dressed with weak iodine solution; twenty cubic centimetres of antitoxin were administered three times subcutaneously, in addition to internal use of chloral 110 grains, one-quarter grain of morphine, bromide 220 grains. Temperature, 102.1° F.

On following day he had less spasm, and received again the same medication. Temperature rose to 102½° F. General spasm continued.

On the 25th he had passed a restless night; still fewer spasms; temperature, 104° F. Antitoxin omitted; continued bromide, chloral, and morphine.

July 26.—Fewer and milder spasms; trismus and opisthotonos continued; medication same. Maximum temperature, 103.2° F.

July 27.—Fewer spasms; comfortable night; one severe spasm in morning. Gave antitoxin twice, twenty cubic centimetres, and medication continued as before. Chloral, 100 grains; bromide, 180 grains; morphine, one-quarter grain. Temperature, 101° F.

July 28.—Had a number of severe spasms at night; became delirious at intervals during day; had involuntary micturition and defecation. Antitoxin, forty cubic centimetres. Temperature, 102.6° F.

July 29.—Spasms continued; patient losing ground; delirious. Stopped antitoxin. Maximum temperature, 105° F.

July 30.—Delirium continued. No nourishment taken. Temperature, 106.4° F. Death in spasm.

This case showed progressive exhaustion from continued chronic and tonic spasms, inability to nourish, and general toxæmia, although nourishment was given by tube and rectum. The antitoxin seemed at first to have some control of spasm, but failed afterwards to show an appreciable value.

CASE II.—P. F., aged sixteen years. October 4, 1898, ran a nail into the sole of his left foot. The wound was incised and packed in Out-Patient Department.

October 10.—Sixth day. Lockjaw set in, with opisthotonos of the back of the neck. Wound found indurated; temperature, 101° F.

Wound excised ; cavity packed with weak iodine gauze ; given twenty cubic centimetres antitoxin subcutaneously ; chloral, fifteen grains ; bromide, thirty grains.

October 11.—Slight increase of stiffness in arms and neck ; 100 cubic centimetres of antitoxin during day ; morphine, one-quarter grain ; chloral, eighty grains ; bromide, 240 grains ; nutritive enemata. Temperature, 104.2° F. Muscular spasms continued to increase from first rapidly. Patient had numerous slight convulsions during night, and died October 12, in violent convulsion, which lasted five minutes, seeming to arrest respiration beyond control.

This case seems to indicate the inefficiency of serum furnished by the Board of Health, used subcutaneously and in moderate quantity in a grave case.

CASE III.—P. McL., aged eight years, was shot July 4, 1899, by a toy-pistol in the left forefinger, and the wound was dressed at a drug store.

July 9 he complained of difficulty in swallowing, and awoke in the morning with head thrown back and jaws locked.

July 10 he was admitted to the Roosevelt Hospital, with cramps in back, progressive stiffening of neck and jaws ; muscles of neck and back and abdomen were found rigid ; skin bathed in perspiration ; frequent spasm of back and spinal muscles, dyspnœa ; temperature, 100.8° F. The hand was dressed. Chloral, twenty grains, bromide, forty grains, were given every three hours ; temperature, 101° F. On the following morning was given twenty cubic centimetres of antitoxin (Board of Health) ; opisthotonos and general spasm, with cyanotic dyspnœa ; temperature, 105.2° F. ; respiration, 40. During the day the spasms were so incessant that he became rapidly exhausted, and died in the afternoon of the next day, July 11, in a respiratory spasm.

CASE IV.—W. R., aged nine years, received, July 4, 1899, a toy-pistol wound in the centre of his left palm.

July 11 his jaws became stiff and sore.

July 12 he entered hospital with pronounced lock-jaw, rigidity of muscles of neck, back, and injured arm ; flexor spasms of forearm of left hand ; difficulty in swallowing ; temperature, 100° F.

I directed my assistant, Dr. Fisk, to make an intracerebral injection of tetanus antitoxin, which was done at the back of the fissure of Rolando, two inches from the median line. The needle was pushed one inch into the brain substance, introducing three cubic centimetres

on each side. Twenty cubic centimetres were also given subcutaneously. Chloral, ten grains, bromide, twenty grains, were given at intervals of three hours, per rectum. The tetanic spasms continued during the following day with increased spasm of injured arm. Sixteen hours after first cerebral injection a second was given, the needle being plunged through the trephine wound. The subcutaneous use of the antitoxin was continued every six hours, twenty cubic centimetres; no marked improvement was apparent up to the end of forty-eight hours, but rather increase of general muscular rigidity. The Parke-Davis antitoxin was begun on the 14th, owing to the Board of Health supply having given out; ten cubic centimetres were given three times daily during July 14 and 15.

July 15 he slept a good part of the night without spasms, and was very quiet. The antitoxin was given five times on the 16th; nutritive enemata; application of ice to the nape of the neck on account of severe pain from muscular spasms; an occasional small hypodermic of morphine; dressing of wound under chloroform. This constituted the treatment for a number of days. The patient, up to the fifth day, presented all the profound symptoms of tetanus; was excited to spasms by handling abdomen. Intense spasm of hand and forearm muscles, relieved by immersion in warm bath of bichloride, 1-10,000. On the fifth day of treatment a dark erythematous rash appeared on the upper half of the left arm and other parts of the body, such as frequently occurs in the administration of antitoxines. Lockjaw was still complete and absolute. There were occasional spasms on this day.

Seventh day, antitoxin, ten cubic centimetres, four times; extreme opisthotonos and general spasms frequent during the day.

Eighth day, rash disappearing.

Ninth day, antitoxin serum, ten cubic centimetres, five times; wounds dressed with peroxide of hydrogen; spasms milder.

Tenth day, passed through morning without spasms.

Thirteenth day, improvement in jaws, which showed slight relaxation. Had been receiving up to this day from fifty to sixty cubic centimetres of antitoxin daily. To-day, fever set in, and consolidation of upper right lobe of lung appeared. Given nitroglycerin; serum continued to the extent of forty cubic centimetres daily; temperature, 105° F. Some increase of muscular rigidity, patient showing exhaustion. Following day, temperature, 105° F. Given nitroglycerin ($\frac{1}{100}$ grain), six times, with strychnine.

Sixteenth day, muscular rigidity much diminished ; temperature, 105.2° F.

Seventeenth day, rigidity and spasms almost gone ; fever less ; opens mouth one-half inch ; little delirious ; oxygen and various stimulants given.

Nineteenth day, more improvement shown ; slept naturally ; pneumonia resolving. During next few days pneumonia cleared, temperature fell, and spasms disappeared, except in the injured hand. Convalescence progressed favorably thereafter, with ultimate perfect recovery ; spasmodic contraction of hand remaining for about six weeks

CASE V.—L. H., aged eleven years, was shot in the left palm by a toy-pistol, July 5, 1899.

Eighth day had stiffness and soreness of muscles of lower jaw. On examination, same day, his jaw opened one-half an inch ; abdominal muscles were not stiff ; some pain in back, none in neck ; some stiffness of left wrist ; temperature, 100.2° F. On the afternoon of this day three cubic centimetres of Board of Health antitoxin were injected into anterior lobe of brain in an effort to place it in the ventricle, the point being located by the kindness of Dr. Rambeau ; at the same time twenty cubic centimetres were injected into the right pectoral region ; chloral and bromide also administered as usual.

Ninth day, tetanic symptoms much more marked ; patient had general muscular spasms, some sensory hyperæsthesia, special flexor spasms of hand and forearm of injured side ; increased knee-jerk in left lower extremity ; head thrown back. Later in the day dysphagia, frequent general spasms. Seventeen cubic centimetres of Board of Health antitoxin and twenty cubic centimetres of Parke-Davis antitoxin were injected.

Tenth day delirium set in ; dense muscular rigidity ; general spasms ; cyanosis from spasm of respiratory muscles. Patient showed rapid exhaustion ; went into opisthotonos on slight provocation ; dyspnœa severe ; death.

This case was one of the severe type ; though taken promptly, it showed no benefit from operation. Injection of Board of Health serum at first was used, and later this was supplemented by a single injection of Parke-Davis antitoxin, but too late to be credited.

CASE VI.—J. M., aged eleven years, was admitted, July 15, with a Fourth of July toy-pistol wound in the centre of his left palm, part

of the wad having been retained. On admission there was some rigidity of the muscles of forearm and hand, which were in a condition of partial flexion, extending up to the elbow-joint.

The case seeming to be of a milder type, I thought it best not to subject the serum treatment to test unless severer symptoms set in.

For one week the muscular rigidity was confined to arm and pectoral region, the only medication being wound treatment with peroxide of hydrogen, and immersion of arm in a hot, weak bichloride solution (1-10,000).

During the second week, from eighth to thirteenth days, slight lockjaw symptoms set in, with general muscular rigidity, but no spasms.

Chloral and bromide were given with no apparent effect. On the fifteenth day after admission general stiffness of all the muscular system became more pronounced, extending to the upper and lower extremities, and the case began to assume a serious aspect.

Two pronounced general spasms with opisthotonos occurred within a few hours. Thirty cubic centimetres of antitoxin serum (Parke, Davis & Company) were given subcutaneously, and continued at fifty cubic centimetres daily for one week.

During this week there was gradual and continuous improvement, there seeming to be a very positive evidence of change from unfavorable to favorable progress.

For three days the serum injections were omitted, during which time there was an arrest in the improvement of the muscular rigidity; he became restless, irritable, did not sleep, the legs and abdominal muscles remaining stiff. Parke, Davis & Company's serum, ten cubic centimetres every four hours, was again given, and patient made continuous improvement, continuing serum in small doses until the fourth week. Good recovery.

This case, though representing a milder type, was arrested at its progressive stage by the Parke, Davis & Company's serum, given hypodermically, and retrograded slightly on stopping medication; improvement being resumed when it was again administered.

CASE VII.—J. B., aged fifteen years, sustained a toy pistol wound of the right hip, in the gluteal fold, July 4, 1899.

On the ninth day, July 13, stiffness of the jaw set in, followed by

oppression of the chest, and by stiff neck and back. In a few hours he had lockjaw, respiratory spasm, and one severe general spasm, with opisthotonos.

On admission, July 18, risus sardonicus was well marked. The jaw was firmly closed, the abdomen, neck, and back were rigid; also the right knee and hip-joint, this being the injured side. The hamstring tendons were tense and the leg could not be brought straight. General hyperæsthesia and increased knee-jerk were present.

The gluteal wound was two inches deep, and about it a marked hard œdema, like lardaceous infiltration, was present. This was promptly excised under chloroform, and peroxide applied.

Later in the afternoon, July 18, I made a double cerebral injection of antitoxin (Parke, Davis & Company), three cubic centimetres, in each frontal lobe.

Cocaine anæsthesia only was used, and no difficulty whatever experienced, the skin alone needing cocaine. The smallest trephine was used, one-quarter-inch diameter, through a one-inch incision made at Roux's point, half-way between the outer angle of the orbit and a point in the vertex, at the junction of the line crossing over between the two auditory canals. No sensation was noted by the patient during the cerebral injection, nor was there any effect produced upon pulse or respiration.

The needle was carried two inches deep into the brain substance. Antitetanic serum (Parke, Davis & Company), ten cubic centimetres, was given also every four hours, subcutaneously.

Two hours after the cerebral injection in this case it was already noticed that the risus sardonicus was less marked, and that the rigidity of the muscles of the neck, jaw, and abdomen had abated a little. The patient also expressed himself as feeling more comfortable.

On the following day the tendency to spasm was less, although stroking the abdomen would bring on opisthotonos. The leg continued very stiff.

During the following week the general muscular rigidity of jaws, face, neck, and back abated a very slight but appreciable amount each day, the patient receiving fifty cubic centimetres (Parke, Davis & Company) daily, in addition to a moderate amount of chloral and bromide. Slight rise of temperature, one degree, on two occasions to 101.5° F., was relieved at once by calomel purge, but at the expense of a slight stomatitis at the end of a week. An urticarial rash appeared on the thighs, forearms, and back on the tenth day after

serum treatment, which, however, disappeared in two days in spite of its continued use.

On the tenth day after the operation there was rapid improvement in the rigidity, and his general appearance was much better.

By the twelfth day the risus sardonicus had disappeared, the jaws could open seven-eighths of an inch, rigidity of abdomen, back, and neck had largely disappeared, so that the chin could be brought down to touch the sternum. On the fourteenth day the serum treatment was stopped.

Four days later nothing remained but a little rigidity of right leg.

This case illustrated rather strikingly slight improvement at once after treatment, and complete arrest of rapidly progressing tetanus, the disease beginning on ninth day after injury, and promising to be of a severe type unless arrested by treatment. It was of interest to note that the trephining was easily done by aid of cocaine.

CASE VIII.—T. B., aged fourteen years, on July 24, 1899, sustained a wound of the left index finger by a toy-pistol shot. On the sixth day thereafter lockjaw symptoms set in; first in the jaw, extending in twenty-four hours to neck, back, and injured arm. The opisthotonos spasms occurred every ten minutes during this day; on the following day, August 11, he was admitted to hospital (eighteen days after injury, and second day of disease).

He was a healthy looking boy; temperature, 99.6° F.; pulse, 100; respiration, 28; jaws were fixed, but teeth could be separated about one-fourth of an inch; face showed marked risus sardonicus; neck and back were very rigid; moderate sensory hyperæsthesia; no exaggeration of reflexes; frequent general muscular spasms took place on slight provocation, with marked opisthotonos.

At 5 P.M., an intracerebral injection of Parke, Davis & Company's antitoxin, four cubic centimetres on each side, was done under chloroform; the needle was introduced one and three-fourths inches into the brain. Antitoxin, twenty cubic centimetres, was also injected subcutaneously, and later ten cubic centimetres every four hours. Chloral and bromide were given every four hours. Violent spasms occurred every one-half or three-quarters of an hour. The patient was regarded as in an extremely dangerous condition; during the next twenty-four hours these spasms were not perceptibly affected, occur-

ring at intervals of one-half to one hour. About ten hours after operation, the patient went five hours without a spasm, but later extreme irritability was present, the slightest touch causing opisthotonic spasms. Two morphine hypodermics were given to dull the irritability. During the second twenty-four hours he evinced difficulty in swallowing, spasms continued hourly. Temperature continually rose till it reached 106° F.; respiration, 140, at 9 P.M. Cold sponging was given with relief, temperature fell to 104° F., and patient fell asleep for three hours. Serum was given subcutaneously to the amount of eighty cubic centimetres in the twenty-four hours. During the latter half of the second day, the disease progressed in spite of the antitoxin. During spasm, the muscles seemed to be universally rigid; marked cyanosis would intervene; oxygen was given and chloroform as needed, camphor, digitalis, etc., used, but spasms increased, and patient died, without abatement of disease, thirty-six hours after the intracerebral injection, with a temperature of 107° F.

This case presented no appreciable benefit from the antitoxin treatment, but must be classed as one of the gravest types of the disease brought under care at a late stage.

CASE IX.—M. S., aged eight years, on September 6, 1899, stepped on a nail, making a punctured wound in the sole of his right foot, which made him walk a little lame for two weeks, so that he noticed no special muscular stiffness till September 25 (nineteenth day after accident), when he commenced to have pain in the small of his back, with stiffness of his jaw and the right leg. This increased and extended to other parts of his body until his admission to Roosevelt Hospital, September 27, on the twenty-first day after injury.

Examination showed muscular rigidity, affecting the muscles of back, abdomen, and neck and lower extremities; most marked in the injured leg. The thigh, leg, knee, and ankle were fully extended; the toes stiffly extended in a straight line; the foot rigidly held in extreme talipes equino-varus; the jaws could be separated one-fourth of an inch; slight risus sardonicus; temperature, 101° F.

Ten cubic centimetres of antitetanic serum (Parke, Davis & Company) were given every six hours. The disease having begun after three weeks' incubation, the case was regarded as one which might continue of a milder type and be credited with a cure by the old-fashioned treatment. It was therefore decided to wait and watch the

patient until the development of graver symptoms, before testing the intracerebral injection.

After twenty-four hours, the rigidity of the jaw had increased, so that voluntary separation of the teeth was impossible; there was increase also in the muscular rigidity of the right leg, back, neck, and abdomen. *Risus sardonicus* was also more marked, and there was more sensory hyperæsthesia.

Two general spasms occurred; boy refused nourishment on account of difficulty in swallowing, and was fed by nutritive enemata.

Trephining and intracerebral injection of Parke, Davis & Company's serum was done under chloroform, September 28 (twenty-second day since accident), third day of disease.

The needle was introduced one and one-half inches and six cubic centimetres injected into the brain, one-half on each side. During the following twenty-four hours the maximum temperature was 100.2° F.; ten minims of antitoxin were injected subcutaneously every six hours. There was no change during the twenty-four hours in muscular rigidity, although he slept better and had no spasms. During the next day, temperature, 101° F., fifty cubic centimetres of serum were injected; bromide was also given. He slept well; the muscular condition was stationary, except that the chin could be brought a little closer to the sternum; no spasms; rash appeared on nose and forehead and chest; temperature, 100.5° F.

October 1.—Third day. Showed great improvement; has slept well; the general muscular rigidity was decidedly lessened; no spasms; jaw could be opened three-eighths of an inch; serum continued, fifty cubic centimetres, with bromide; temperature, 100.4° F.

October 2.—Fourth day. Still improving in muscular rigidity; jaws relaxed one-half inch; slept well; took nourishment; temperature, 100.8° F., fifty cubic centimetres serum, bromide.

October 3.—Fifth day. Omitted serum; *risus sardonicus* disappeared; jaws relaxed three-fourths of an inch; no rigidity of neck or arms; abdominal rigidity very slight; foot still held in equinovarus; the muscles of the calf, which had been continuously contracted and stood out as hard as wood, were now softening; maximum temperature, 100° F.

October 4.—Sixth day. Little rigidity left anywhere, but in right hip and ankle. Sat up in bed ninth day. Urticarial rash on legs, trunk, arms, and face; temperature, 100° F.; boy seemingly otherwise well.

October 11.—Rash had disappeared on October 10, tenth day;

temperature normal. Sat up in chair; went out in garden on the fourteenth day. Three weeks after operation went home, slight rigidity of ankle still remaining.

Remarks.—Considering the foregoing cases, I would note that the common observation that a long period of incubation is an absolute criterion of the probable severity is an error.

In considering these nine cases, I find two only can be regarded as in sense of a milder type, one commencing on the 10th, and one on the 19th, the day after injury. The other seven were of a grave type.

Of the seven occurring during the epidemic of the past summer, five were so severe, either at the onset or in the progress of the disease, that they were deemed worthy of being subjected to the test of trephining. Of these five, three recovered and two died.

The cases which recovered had their onset on the seventh, ninth, and nineteenth day of incubation; the cases which died, on the eighth and sixteenth day of incubation.

In two of the trephined cases the Board of Health toxine was used; one died and one recovered. In three cases Parke, Davis & Company's serum was used; two recovered and one died.

There were five of the nine cases in which one could perceive an apparent effect of the serum treatment.

In Case No. I, in which it was given only subcutaneously, the Board of Health serum (1898) was used (see note). Though the patient subsequently died, improvement was certainly noticed.

In Case No. IV, Board of Health serum (1899) was used by trephine and subcutaneously, and the patient recovered.

In Case No. VI, the Parke, Davis & Company serum was used only subcutaneously. Improvement was demonstrated, and the patient recovered.

In Cases Nos. VII and VIII the Parke, Davis & Company serum was used, and the favorable effect was observed. Both were trephined and serum used in the brain and subcutaneously. Both recovered.

The favorable action was shown either in a prompt arrest of the general convulsive spasm or in an abatement of the progressively bad symptoms.

The serum furnished by Parke, Davis & Company was available in the midst of the summer epidemic of tetanus, if we may call it so, at the moment when the Board of Health ceased to furnish more from lack of supply, and it proved itself, both by comparison and in its actual results, noticeably more efficient.

This limited experience leads me to regard it as a valuable adjunct in the scientific treatment of this grave malady, and I can but regard the cerebral injection as an advance over the subcutaneous method worthy of extended trial and further study.

A NEW METHOD OF SUTURE IN OPERATIONS FOR INGUINAL AND OTHER FORMS OF HERNIA.¹

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THE great majority of surgeons concede first place to the Bassini method in the radical cure of inguinal hernia. The most important step in the operation, that upon which success depends, is the adequate closure of the internal ring. This was formerly accomplished with sutures of silk, but at present silver wire, catgut, or kangaroo-tendon are employed. It is well recognized, however, that in spite of the greatest care, and in the hands of the most experienced operators, suppuration occasionally results. Sometimes the sutures are originally contaminated, or they may become so by the hands of the surgeon, occurrences which are difficult to avoid. On other occasions infection is due to the impossibility of obtaining perfect asepsis of the skin.

Whatever the cause, the infected sutures must come away before complete recovery can ensue. With catgut this may require a number of weeks. When silk has been used, a much longer time usually elapses before the annoying sinus finally closes.

Even when the wound heals by first intention, a sluggish inflammation not uncommonly develops, leading to the formation of a sinus, which remains until the offending material works its way out.

¹ Read before the Wyoming State Medical Society, October 10, 1899.

Endeavors have recently been made to avoid these complications, either by the use of removable sutures, or by the avoidance of sutures altogether. For instance: Harris, of Chicago (*Journal of the American Medical Association*, September, 1899), and Link, of Lemberg (*Centralblatt für Chirurgie*, No. 12, 1899), insert running sutures, which are brought out onto the surface of the skin, and subsequently extracted by pulling on their ends. Faure (*Centralblatt für Chirurgie*, No. 8, 1899, p. 242), on the other hand, splits the hernial sac longitudinally and uses the divided ends to unite the borders of the internal ring.

An objection to the first method is that it will not hold the parts firmly together in the presence of tension, which exists when the opening is at all large, or when vomiting or coughing occurs. The second method is only applicable when the sac is long and thick-walled, which is by no means always the case;



FIG. 1.—Showing suture in needle.

and it may be questioned whether the union is ever sufficiently firm when even moderate tension exists.

The procedure I am about to describe presents the following advantages: (1) It is simple and quickly executed. (2) Any reasonable amount of tension can be readily overcome, which is of paramount advantage when the internal ring is large. (3) The sutures cannot cut through, which must frequently occur in other procedures, especially if vomiting or coughing should supervene. (4) A large amount of muscle can be bunched up against Poupart's ligament, thus increasing the likelihood of permanent cure. (5) The sutures can readily be removed, leaving nothing to give rise to irritation or to a sinus.

Previous to the operation, two or three needles are threaded with long loops of silkworm-gut (silver wire may be used) (Fig.

1), and two pieces of stiff, silvered wire are procured, long enough to reach the entire length of the inguinal canal, cut through the external ring and beyond the surface of the skin (small probes answer the purpose well).

The internal ring is exposed, the sac ligated and cut off or knotted upon itself (Duplay and Cazin, *Semaine Médicale*, No-

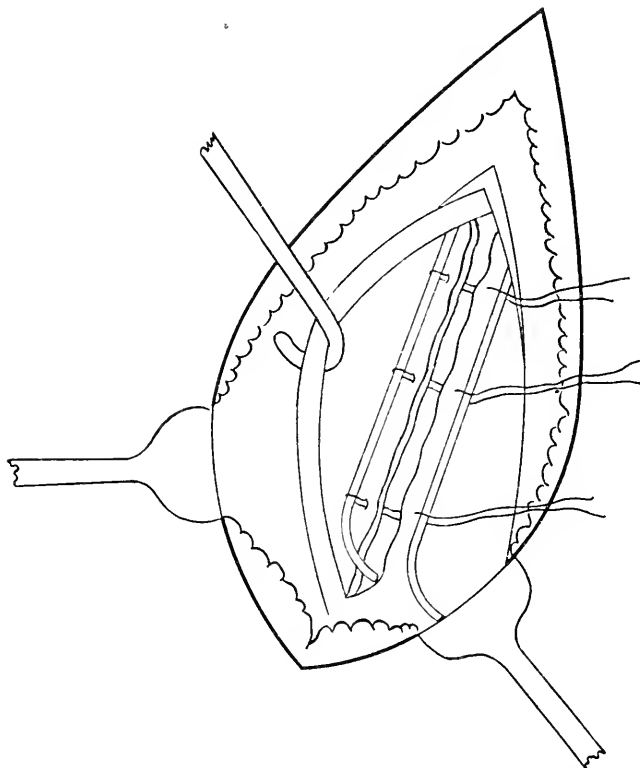


FIG. 2.—Showing position of pins and sutures before approximation.

vember 11, 1899), and the cord held out of the way. One of the silkworm-gut loops is passed from without inward through the muscular tissue on the umbilical side of the ring, well back from the margin, and fairly close to the point of exit of the spermatic cord. The loop is then carried through Poupart's ligament from within outwards, some distance from its free

edge. Another loop is similarly inserted near the pubic limits of the opening.

One of the previously prepared wires is now run through the loops, which are pulled tight enough to hold it in place. The other wire is laid along Poupart's ligament between the free ends of the loops (Fig. 2), which are firmly tied over it, thus approximating the wires and bunching a quantity of mus-

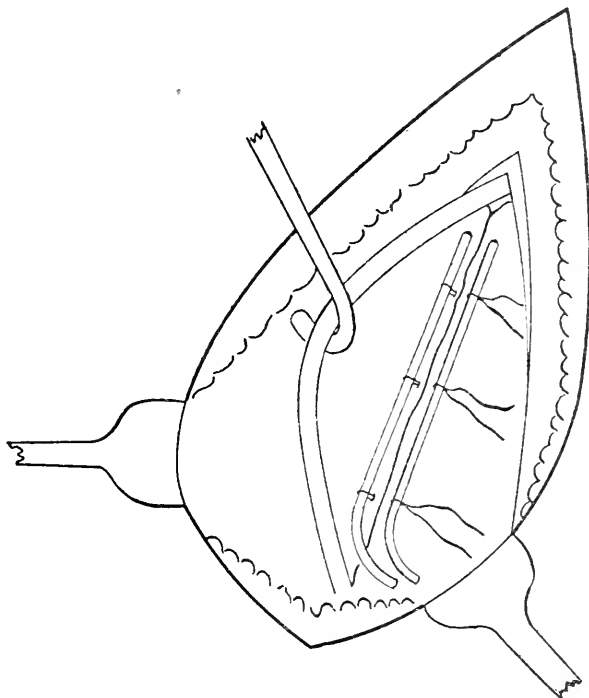


FIG. 3.—Showing position of pins and sutures after approximation.

cular tissue against the ligament. Before finally inserting the wires they should have been bent upward at their pubic extremities, so as to protrude through the external incision, thus facilitating their removal. The ends of the wires furthest from the pubes must be so placed that they leave the new internal ring neither too large nor too small.

The cord is now dropped in place over the line of union, and the aponeurosis of the external oblique united above it,

the upturned ends of the wires passing through the external ring. As the aponeurosis is not subject to tension its accurate union is not of so much importance, and Harris's removable suture may be employed if desired. Catgut, however, is not so objectionable as it is in the deeper portions of the wound, as it comes away more readily in case of suppuration.

In uniting the skin, the free ends of the loops and the ends of the wires are brought out through the incision between the stitches.

In from ten days to two weeks, which are long enough to procure reasonably firm union, the wires are removed by pulling on their protruding ends. This frees the loops, which are likewise readily extracted. It should not be lost sight of in this connection that, after union has taken place, sutures are of little or no utility; if there is no tension they are superfluous, and if there is tension they are equally so, because they will cut through the tissues.

I have employed this method three times with satisfaction,—in a boy of twelve, a man of fifty-five, and a young man with a very large internal ring. The technique is simple, and I am sure that those who try the procedure will be pleased with the results. It is especially indicated when the internal ring is large, or where tension is feared.

The method may be readily adapted to umbilical or to ventral hernia, and would probably be particularly useful in cases where the opening is large and tension correspondingly great.

FRACTURE OF THE NECK OF THE HUMERUS WITH
DISLOCATION OF THE UPPER FRAGMENT,
WITH A REPORT OF THREE CASES
TREATED BY OPERATION.¹

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THE serious and rather rare combination of fracture of the humerus at the surgical neck or higher, with simultaneous displacement of the head from the glenoid cavity, has been known to surgeons since before the Christian era. Equally ancient is the device of securing the best possible union of the bone before making vigorous efforts to reduce the dislocation. (This paper does not include cases of fracture resulting from attempts to reduce old dislocations of the shoulder.)

The fracture may take place at the surgical neck or at any point above up to the anatomical neck. In ninety-six cases collected by McBurney and Dowd (*ANNALS OF SURGERY*, 1894, xix, 401), sixty-nine were at the surgical neck and twenty-seven at the anatomical. The fissure may be limited to the anatomical neck, but if it lies as high as that point there are usually other fissures splitting off the tuberosities. According to Poirier and Mauclaire (*Revue de Chirurgie*, 1892, 865), of 102 cases in which the fracture occurred at the surgical neck, in only two was comminution present, but in five others a second fissure existed at the anatomical neck. In my three cases, one was at the surgical neck, one at the anatomical, and the third was a fracture at the latter point, with comminution of the tuberosities.

¹ Read before the New York State Association of Railway Surgeons, by invitation, November 16, 1899.

The head may lie displaced in any of the situations occupied in simple dislocations. When the fracture is at the anatomical neck the head is most frequently found in the axilla; but there are two cases on record in which it lay posteriorly beneath the spinous process of the scapula (Houzelot, quoted by Delpech, *Chirurgie clinique de Montpellier*, 1823, Vol. i, p. 233, and Brinton, quoted by Souchon, *Transactions of American Surgical Association*, 1897, p. 332,—a fracture involving the tuberosities also). According to Poirier and Mauclaire (*loc. cit.* p. 866), of 103 cases of fracture of the surgical neck the head of the bone lay in the subcoracoid position in eighty-six cases, intracoracoid in thirteen, subglenoid in three, and subspinous in one case. It will be noted that in these cases there is an unusual proportion of the infrequent displacements of the head, for in the simple dislocations of the shoulder axillary and intracoracoid displacements are not common. In my cases the simple fracture through the anatomical neck was accompanied with displacement of the head in the axilla, while in the other cases there was a subcoracoid dislocation.

The prognosis of this injury under the older conservative methods of treatment was not good, for the dislocation generally remained unreduced. If reduction is not accomplished, the disability may be less than when a simple dislocation of the shoulder has been left unreduced, especially if the upper fragment is small, and the lower fragment is so situated as to articulate well with the scapula. But even in such cases complete ankylosis may be produced by the misplaced callus thrown out around the bones, and, indeed, some sort of union between the ends with a consequent limitation of motion is the rule. Suppuration at the point of fracture is rare, and so also is necrosis of the upper fragment, no matter how small it may be. In exceptional cases a fair functional result may follow, the stiffness of the shoulder-joint being to some degree atoned for by the great mobility of the scapula. But in addition to stiffness of the joint, the displaced head presses upon the vessels, causing serious disturbance of the circulation (gangrene has been known to follow), and upon the nerves, producing great pain. The patients are generally eager to have an

attempt made to relieve them, even when the function of the limb is not bad. The results of late operations done to correct the deformity and other consequences of this injury are unsatisfactory, and therefore it is essential to treat the cases properly in the beginning. This paper is limited to the consideration of cases treated immediately or within the first month after the injury.

The methods of treatment recommended are four,—reduction by manipulation, production of a false joint or nearthrosis, resection of the upper fragment (the head of the humerus), and open arthrotomy with reduction of the head. The ancient method of securing union of the fracture first, and then attempting reduction four to six weeks after the receipt of the injury, has given such poor results (three doubtful successes, all fractures of the surgical neck, in a series of ten cases) that it is now almost universally condemned. Even in 1884 (*France médicale*, 1884, p. 1613), Berger said that this method was not merely useless but dangerous, on account of the adhesions of vessels and nerves to the callus and new cicatricial tissue. We need not consider it at greater length.

(A) *Reduction by Manipulation*.—In every case the first and immediate duty of the surgeon is to make careful attempts to return the head of the humerus to the glenoid cavity by suitable manipulation. It was formerly taught to make forcible traction with the heel in the axilla; but this method is useless, because the head has been separated from the shaft of the humerus, and cannot be made to move by traction exerted upon the latter. Richet (*Mémoires de la Société de Chirurgie*, Paris, III, 1853, p. 445) emphasized the value of pressure upon the head with the fingers without traction, especially when the head lay in the axilla,—“*méthode de refoulement*.” Stimson, in the first edition of his “*Treatise on Fractures*” (Philadelphia, 1882, p. 382), followed by Berger, recommends gentle traction, in hopes that periosteal connections may have been left which will allow of some control of the movements of the head in addition to the direct pressure. We would add the suggestion that in some cases gentle rotation might assist the traction, especially in cases with some impaction. Forcible efforts would only do

harm, as they would separate the remaining connections between the fragments, and might pull on the capsule in some cases in such a manner as to close the rent through which the head had escaped. A possible exception might be made in the case of simple fracture of the anatomical neck with displacement, for in such a case, after opening the joint from above, the writer found that the close approximation of the upper end of the shaft to the glenoid cavity was the main obstacle to reduction of the head, and the latter was accomplished only by forcibly separating the two bones by traction upon the humerus and by crowding the fingers into the articular space. In cases of fracture at the anatomical neck, therefore, if gentle traction fails, forcible traction may be tried with the arm in abduction, while pressure is made on the head, in hopes that the cleft of the joint may be sufficiently widened to allow the head to return. An anæsthetic should always be administered, and undue violence must be avoided.

Thamhayn ("Dissertation," Halle, 1868, see *Schmidt's Jahrbuch*, 1868, cxl, p. 194) collected sixty-eight cases in which reduction was successful in twenty-two. McBurney (*ANNALS OF SURGERY*, 1896, xxiii, p. 502) collected eighty cases with thirty-six successes, the increased number probably being due to the more general use of anæsthetics and to the earlier diagnosis.

(B) *Production of a False or New Joint*.—It was held by some of the older surgeons that, if reduction were impossible, the best treatment would consist in beginning passive exercise at once, in order to preserve the motions of the part; in other words, trying to form a new joint between the fractured surfaces or between the lower fragment and the scapula. In 1843, Riberi treated a case by thus making a false joint at the seat of fracture, and this method is generally known by his name. It has proven especially useful when the humerus has been broken in attempts to reduce an old dislocation of the shoulder. A number of cases of simultaneous fracture and dislocation are also on record as having been so treated, but it cannot be said that the results are encouraging. The patient appears to have obtained somewhat more motion than if the case had been left to nature, and a decidedly better position of the arm than if

the humerus had been allowed to consolidate at the point of fracture. But the joint was unsatisfactory in its movements, and the displaced head caused pain and disturbances of the circulation by its pressure. This method may then be laid aside with the ancient method except for cases in which circumstances render operative treatment impossible. If employed at all, the passive and active motions should be begun at the earliest possible moment after the injury.

(C) *Resection*.—As early as 1823, Delpech, in his *Chirurgie clinique de Montpellier* (Vol. i, p. 233), advised immediate removal of the displaced head in cases with fracture of the anatomical neck, for fear of necrosis. Morton in 1884 (*American Journal of the Medical Sciences*, lxxxvii, p. 173) appears to have been the first to attempt it in a recent case, although it had been removed in old irreducible dislocations before that date. Souchon (*loc. cit.*, pp. 322–332) quotes ten cases so treated (Tripier, Porter, Morton, Mauclore two, Croft, Clutton, Monks, McGraw, and Brinton). Gerster reports (*ANNALS OF SURGERY*, 1898, xxvii, p. 660) a subglenoid displacement of the head, with fracture of the anatomical neck, treated by resection four weeks after the injury, followed by infection of the wound and death in five days. The following case of mine also belongs here.

CASE I.—*Comminuted Fracture of the Upper Extremity of the Humerus, with Subcoracoid Displacement of the Head; Resection; Recovery*.—E. H., twenty-nine years old, single, native of the United States, a truck driver by occupation, was admitted to my service at Bellevue Hospital March 9, 1899. He claims previous good health, and denies venereal disease, but uses alcohol to excess. Two days before admission he had a “fit” while at work and fell, striking on the left shoulder, and did not regain consciousness until some time afterwards. An examination of the shoulder under ether was made, and a large bony mass was found in the subcoracoid region, with great thickening of the upper end of the humerus—of which the mass seemed a part. The elbow could be brought to the side, and there was but little shortening. Crepitus near the upper end of the humerus could be recognized, but the exact situation of the fracture could not be determined because of the great swelling of the parts from effused blood. There was no deltoid flattening, and the injury

was evidently neither a simple dislocation nor a fracture of the surgical neck of the humerus. The diagnosis was left open between fracture of the anatomical neck with displacement of the head, and comminuted fracture through the anatomical neck and tuberosities. March 12 the patient became very noisy and was transferred to the alcoholic ward. On recovery from the nervous symptoms, an X-ray picture was taken very kindly for me, by Dr. F. W. Gwyer, which clearly showed the glenoid cavity to be empty, and less distinctly indicated a fissure through the tuberosities, and the presence of the head of the bone beneath the coracoid process. The swelling had meanwhile subsided, so that the head of the bone could be distinctly

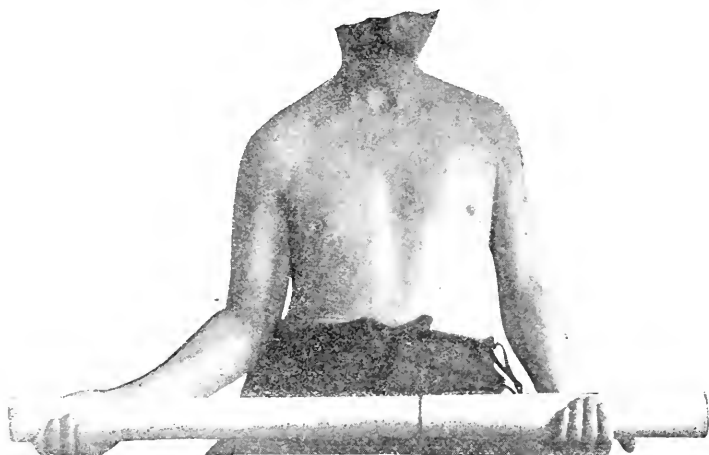


FIG. 1.—Showing scar of operation for fracture dislocation of humerus and loss of external rotation.

felt in its abnormal position. It was evident that if nothing were done, the shoulder would become completely stiff and useless from the displaced head, and excess of new bone close up to the joint, and operation was accepted by the patient. The shoulder-joint was immovable and painful.

March 28.—Ether was administered, and an anterior incision made over the head of the bone along the margin of the deltoid. The head of the bone was found in the tissues below the coracoid process, having been separated from the shaft exactly along the anatomical neck, and lying with its fractured surface turned towards the broken end of the shaft, partly overlapping the latter. As there was danger of necrosis if this small fragment of bone, which lay entirely

outside of the capsule, were separated from the vascular connections formed in the three weeks elapsed since the injury, and forced back into the glenoid cavity, no attempt at reduction was made. The head was easily removed from its loose bed. There was so much callus forming about the upper end of the humerus, the tuberosities being also detached, that a large part of the greater tuberosity was also removed, in order to improve the chances for free motion of the joint afterwards. The wound was closed with sutures with a small rubber-tissue drain, and a dry sterilized gauze dressing applied. Absolute primary union followed. Motion was begun in the joint ten days after operation, especial attention being paid to the voluntary movements. The patient was discharged April 24, with fair motion developing.



FIG. 2.—Showing amount of abduction. (Angles of scapulæ marked.)

The photographs, taken October, 1899 (Figs. 1, 2, and 3), six months after operation, show the scar and the range of motion of the shoulder-joint proper, the scapula being held stationary. Abduction is about one-half the normal, internal rotation nearly normal, and external rotation is much limited. The shape of the shoulder is good, the deltoid well nourished, and head of the bone is so closely united to the scapula that there is no slipping in any position, and all movements are effected with considerable power. The patient is doing heavy work and the arm is gaining strength. There is some atrophy of the infraspinatus and supraspinatus muscles, which may be due to disuse, as it appears to be diminishing. Neither these muscles nor their nerves were directly involved in the injury to the joint or in the operation.

(D) *Reduction by Open Arthrotomy*.—Free incision upon the displaced bone, and opening the joint for the purpose of reduction is such a modern operation that Poirier and Mauclairé in their essay in 1892 do not even mention it among the methods of treatment. It is an American operation, for as early as 1859, in the first edition of his "System of Surgery" (Vol. ii, p. 194), the great Gross strongly urged immediate arthrotomy



FIG. 3.—Showing facility of internal rotation.

in these cases when attempts at reduction otherwise had failed. Nélaton (*Archives générales de médecine*, 1888, p. 450) also suggested it as an adjuvant to the ancient method after the fracture had been consolidated. Stemen (*Journal of the Medical Sciences*, Fort Wayne, Ind., 1893, Vol. xiii, p. 170) appears to have been the first to cut down upon the displaced head in a case of recent injury.

His operation was done in 1870, and he reduced the head, and secured a good result. Porter did a similar operation in the year 1893, and McBurney followed in 1894. The last-named surgeon invented a useful instrument shaped like a "boot-hook," the point of which could be inserted into a hole bored in the upper fragment, while the powerful handle allowed traction and even rotation to be executed easily. In 1895 came my first case. In 1896, Berger, of Paris, and Bull each operated upon a case. Wölfler is reported by MacCormac (French Surgical Congress, 1893, *Transactions*, p. 384) to have operated successfully. Some of the surgeons mentioned have had other cases, and a third has recently come into my hands. Souchon (*loc. cit.*) quotes nine of the above cases, and to his list are to be added two cases by McBurney (Stimson, "Fractures and Dislocations," Philadelphia, 1899, p. 579), one each at the surgical and anatomical neck; a case at the surgical neck by Morton (*ANNALS OF SURGERY*, 1896, xxiii, p. 756); and my two cases here given,—all successful reductions with good functional results, except Morton's. Morton operated upon a man seventy-four years old immediately after fracture of the surgical neck with dislocation, who died of syncope when first allowed out of bed, eight days after the operation, when the wound was healing well without infection.

The two cases operated upon by me are as follows:

CASE II.—*Fracture of the Humerus at the Surgical Neck with Dislocation; Arthrotomy; Reduction and Wiring of Fragments; Recovery.*—C. G., fourteen years old, school-boy, native of the United States. He fell and injured the left shoulder, and received no proper treatment. When examined, four weeks after the injury, there was no pain, but the motions of the shoulder-joint were greatly limited. The elbow could not be raised from the side, scarcely any rotation was possible, and only slight antero-posterior motions could be made voluntarily. The extent of passive motion was somewhat greater. The deformity of this injury is well shown in the photograph taken before operation. (Fig. 4.)

The head of the humerus was displaced beneath the coracoid process, and there was a fracture of the surgical neck with upward

and outward displacement of the lower fragment, and beginning union.

He was admitted to my service at St. Luke's Hospital, and December 4, 1895, under ether anæsthesia, an anterior incision was made over the head of the bone along the border of the deltoid. The line of fracture was transverse, crossing the neck about an inch below the tuberosities. When the head had been somewhat freed, a

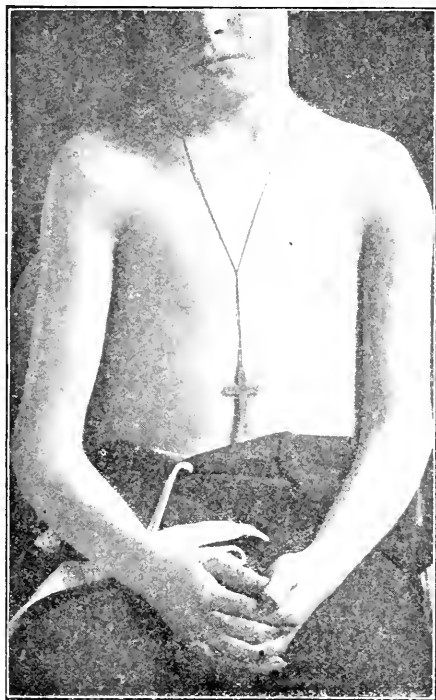


FIG. 4.—Before operation.

hole was bored into the upper fragment just below the tuberosities, and McBurney's hook inserted. But when attempts at traction were made, the bone proved to be too soft to hold the hook, giving way around the edges of the drill-hole and allowing the hook to slip out. Very free division was then made of all resisting bands, and with fingers and blunt instruments the head was forced into the glenoid cavity. As the shortening of the arm measured two inches, about one inch had to be removed from the lower fragment before appo-

sition of the broken ends could be obtained. The head of the bone after reduction remained in a position of inward rotation, on account of adhesions or shortening of the muscles. The lower fragment was therefore rotated inwards as far as possible, and the bone reunited with silver wire. The wound was sutured, and primary union followed, gentle passive motion being begun in ten days, and systematically carried out after the third week.

When shown to the New York Surgical Society (verbal report in ANNALS OF SURGERY, 1896, xxiii, p. 738), three months after the operation, the patient could lift the arm forty-five degrees from the vertical without moving the scapula, and was constantly gaining. Inward rotation was greater than normal, and outward rotation was somewhat limited. It has since been reported to me that he has improved, and that the arm is nearly as good as the other.

CASE III.—*Fracture of the Anatomical Neck of the Humerus; Subglenoid Displacement of the Head; Arthrotomy; Reduction and Pegging of the Fragments; Recovery.*—E. B., eleven years old, school-girl, born in England, was admitted to my service at St. Luke's Hospital September 26, 1899. Previous health good. Soon after birth her mother noticed that the left arm was crooked, and the child has never had full use of it. She always held the elbow flexed, and was unable to put the hand over and back of her head except by "throwing" it over. This disability appears to be due to paralysis of some muscles and contraction of others.

The day before admission, while running in the street, she tripped and fell on her left shoulder and her head. She had severe pain in the shoulder and could not raise the arm, but walked home without assistance. Next morning the shoulder was swollen, and a physician made the diagnosis of "posterior dislocation."

September 26, on admission, ether was administered, and the shoulder was examined carefully. The arm could not be adducted and the elbow was held slightly flexed. There was moderate swelling of the shoulder, and a marked projection posteriorly under the acromion near its origin from the spine of the scapula. The head of the humerus was felt in the axilla and did not rotate with the shaft, but crepitus was felt between the fragments on rotation. The small size of the fragment indicated a fracture at the anatomical neck. The posterior projection consisted of the upper end of the shaft of the humerus. Strong extension was made, after gentle attempts had failed, with forcible pressure upon the head of the bone, but it could not be returned to the glenoid cavity. As the parts were not much

contused, immediate operation was advised and consented to by the parents.

An anterior incision was made along the border of the deltoid, but it was found impossible to make a free exposure of the head of the bone by this route, and little or no division of the deep parts was made in this line. A posterior incision was then made crossing the base of the acromion, as in Kocher's method for resection of the shoulder, and curving forwards just above, or internal to, the upper border of that process. The base of the acromion was divided and its muscular attachments above severed. The detached acromion was then turned downward and forward in the flap, carrying the deltoid with it, and after some division of the deltoid along its posterior border, and of the subscapularis, a satisfactory view of the glenoid cavity was obtained. It proved unnecessary to divide the capsule of the acromio-clavicular articulation,—as is the rule in Kocher's method. The index finger of the left hand was crowded into the glenoid cavity between the scapula and the upper end of the humerus, while an assistant made strong extension on the arm, and then by very forcible direct pressure upon the head made by the right hand, some fingers being inserted in the anterior wound, and the rest acting in the axilla, the displaced head was with difficulty forced into the glenoid cavity. The line of fracture corresponded exactly with the anatomical neck and the tuberosities were not injured. There was a little tendency for the shaft to ride upward and backward past the head, and a long bone-drill was inserted directly through the outer aspect of the shoulder, grazing the upper end of the lower fragment, and driven deep into the head. By rotating the latter, one could tell when the point of the drill had reached the articular surface, and it was not allowed to penetrate the glenoid. The wound was closed by deep and superficial sutures after the acromion had been united to its base with a silver wire suture, and no drainage was employed. A dry sterilized gauze dressing was applied, over which was placed a spica bandage of plaster-of-Paris, the head of the drill projecting through all the coverings. Extension straps were applied to the arm just above the elbow, and the patient placed on the back in bed with the arm in line with the spine of the scapula, *i.e.*, in full extension, a weight of three pounds acting over a pulley, at the side of the bed, to make traction.

The temperature rose to $101\frac{4}{5}^{\circ}$ immediately after the operation, but there was very little pain. For the first two days the temperature ranged from 100° to 101° ; thence onward, it did not go above 100° .

October 4 (eighth day) the wound was dressed and complete primary union was found. The next day the child was allowed up, the wrist being supported with a sling and the weight hung from a loop of bandage across the bent elbow, the latter hanging by the side. October 16 the drill was removed, and three days later the weight was discontinued. The dressing at this time consisted of a plaster-of-Paris shoulder-cap and spica bandage, and the child was directed to make any movements which this light apparatus would allow. November 8 all bandages were removed and the motions of the shoulder tested appearing to be nearly as good as before the accident. The condition at present (November 16) is as follows: abduction to sixty degrees (over half of the normal); adduction complete; internal rotation almost normal; external rotation much limited; antero-posterior movements free. In all of these the scapula is held in the normal position of rest. The child can "throw" her arm over and behind her head, and otherwise use it just as she used to do, and can also pass it behind the back. There is no atrophy of the deltoid.

Comparison of Reduction and Resection.—In order to obtain an idea of the relative merits of these two procedures, reduction and resection, we must first remember that even the best functional result after resection, of which the first case reported herewith may be taken as an example, is not to be compared to the nearly perfect shoulder-joint which can sometimes be obtained by returning the normal head to its natural articulating cavity. The result of a reduction may fall considerably below this perfection and yet be as good as the best obtainable by resection. We shall therefore classify the results of reduction as good, fair, and bad, and the results of resection as fair, improved, and bad. It should be added that even the poorest functional result found in the cases so far reported is a great improvement upon the condition of an arm left without operation.

RESULTS OF OPERATION.

Fracture of Surgical Neck.	Good.	Fair.	Improved.	Bad.	Died.
Reduction.....	Stemen I.	Berger	.....	Porter II. (resected.)	Morton II.
“	Stemen II.	.....	.....	.....	.....
“	Porter I.	.....	.....	.....	.....
“	McBurney I.	.....	.....	.....	.....
“	McBurney III.	.....	.....	.....	.....
“	Curtis II.	.....	.....	.....	.....
Total	6	1	.....	1	1
Resection .....	.....	Tripier	Porter II.	.....	.....
Total .....	.....	1	1	1	.....
Anatomical Neck.					
Reduction.....	McBurney II.	Bull	.....	.....	.....
“	McBurney IV.	Wölfler	.....	.....	.....
“	Curtis III.	.....	.....	.....	.....
Total	3	2	.....	.....	.....
Resection ¹.....	.....	Mauc laire II.	Croft	.....	Morton I.
“ .....	.....	Clutton	Brinton	.....	Monks
“ .....	.....	McGraw	.....	.....	Gerster
“ .....	.....	Curtis I.	.....	.....	.....
Total .....	.....	4	2	.....	3
Total, 25 cases...	9	8	3	1	4

Theoretically, we would assume that in fracture of the anatomical neck resection would be the better operation, for reduction might result in union with slight displacement of the small fragment, or adhesions might form because of the small blood supply of the head, or the callus might encroach upon the articulating surfaces, and the motions of the joint might be impaired by any of these causes. On the other hand, we would suppose that in fracture limited to the surgical neck reduction would give an excellent result, as the line of the fracture is far removed from the joint, and the latter might not even be exposed during the operation; while resection would remove so

¹ Mauc laire I. also belongs here, but no details of result are given.

large a portion of the bone as to tend to the production of a flail-like articulation. Let us see how these ideas are borne out in practice.

We have in our list only two cases of resection after fracture of the surgical neck, one with a fair functional result, the other improved, and the data are insufficient to determine the question. The results of reduction for this inquiry are six good, one fair, and one bad,—the last being Porter's second case in which infection took place with necrosis and subsequent resection.

After fracture of the anatomical neck treated by reduction there are three good results and two fair, to set against four fair results and two cases improved after treatment by resection. The results of reduction for this injury, then, are far better than we would theoretically suppose.

In all we have twenty-five operations, with nine good and eight fair functional results; three cases improved and one bad result. The four remaining cases terminated fatally. Porter's second case counts twice, as a bad result after reduction, and improved by resection. To obtain such good results after an injury which without operation generally greatly impairs, if it does not destroy, the usefulness of the limb, would warrant quite a high mortality; but when the four fatal cases are studied it will be seen that the death was not always due to the operation. Monks's case died four days after a resection carried out on the day following the injury, with symptoms of some abdominal condition, probably a simultaneous internal traumatism received. The wound was seen to be healing well. Morton's second case occurred in a man seventy-four years of age, who died on the eighth day after successful reduction, when the wound had practically healed, syncope coming on when he was first allowed to sit up out of bed, and the death may be charged to some heart-lesion or old age. In Gerster's case "the patient reacted poorly from the operation, the wound suppurated," and we cannot say that the result was not due to septic infection of the wound. Morton's first case died three weeks after the operation, with symptoms indicating pyæmia secondary to the suppurating wound of operation. Only two

deaths are therefore due to the operation,—less than ten per cent. mortality,—and it is clear that the danger of operating upon these cases has been exaggerated.

As the principal danger appears to lie in infection of the wound, it becomes interesting to study the course of these wounds. In twenty-two cases (counting Porter's second case twice) the course of wound-healing is known, primary union having been obtained in fourteen cases, suppuration occurring in eight, and terminating fatally in two of these. As to the effect upon the functional result, suppuration occurred only once in the seven cases which yielded finally a good result, twice in the seven cases with fair result, and twice in the three cases which were merely improved, while in the only case with a bad result it caused necrosis of the head. This is as was to be expected, for suppuration would certainly tend to impair the ultimate result, even if it did not produce serious consequences otherwise.

Resection is always an easier operation than reduction under similar circumstances, and leaves a wound which is a simpler cavity, free from loose bone liable to necrosis. The danger of shock, severe loss of blood, and wound infection would be naturally greater with open reduction, but our cases hardly confirm the importance of these dangers. Of eleven cases of reduction there was suppuration in only three cases, with one good functional result, one fair, and one bad. Of ten cases of resection suppuration occurred in four, with one fair result, one case improved, and two deaths. Porter's second case is omitted from the resected cases because suppuration was present already when the resection was done, but is included in the reductions as a bad result. These figures, however, are so small that they do not overthrow the theoretical advantages of resection in regard to wound-healing, as accidental circumstances might easily control the results in such a small series of cases.

Technique.—In these operations, the incision parallel to the anterior border of the deltoid muscle is the best for all anterior displacements of the head, and generally lies directly over that part. When the head is in the axilla, an incision in

that region directly over the head allows of easy access to the upper fragment, but affords no facilities for its reduction. Accordingly, we find that the axillary incision was employed only once in the three cases of subglenoid dislocation in which the head was reduced, while it was used in all the eight cases treated by resection.

The choice of incision in these subglenoid displacements is quite important, and the fact that in most of these cases the axillary incision was employed may explain why the head was removed in eight out of eleven cases, all with fracture of the anatomical neck. Wölfler alone succeeded in reducing the head through this incision. Bull and McBurney succeeded in reducing the head through anterior incisions along the deltoid. In my case the anterior incision was tried and found useless, and a posterior one was added. The posterior-superior incision seems to me the most suitable for this class of cases. Whether we employ Kocher's method, as in my case, or some other, will allow of further study. Severeano, of Bucharest, recommended at the French Surgical Congress of 1893 a method for opening the shoulder-joint which might be found useful.

He makes an incision across the top of the shoulder a little inside of and above the acromion and parallel to it, dissects up the skin until the bone is uncovered, and then saws the acromion longitudinally, so as to detach its external border with the attachments of the deltoid. Another incision is carried vertically downward from the posterior end of the first, and if necessary a similar incision can be added at the anterior end along the anterior border of the deltoid. These two incisions (or three) form a flap with the border of the acromion in its upper edge, and its substance made up of the deltoid muscle and skin. On turning this flap down good access to the joint is obtained, the subscapularis tendon only needing partial division. The deltoid attachments are perfectly restored by suturing the portion of the acromion in the flap to the remainder of that process. The method is more complicated than Kocher's, but would seem to afford greater security of bony union of the acromion.

A posterior displacement of the head would require a posterior incision with or without division of the acromion.

McBurney's hook will often be found of service, but, as in Bull's case and mine, it may tear out of soft bone. Generally, the fingers and blunt instruments used as levers will suffice to return the head of the bone to its place, but in some cases extensive division of bands, capsule, etc., and the employment of considerable force will be necessary. As we are speaking only of recent cases (within the first month), the glenoid cavity will not be filled up with fibrin and connective tissue, a complication which renders later operations very difficult.

After reduction of the upper fragment, some surgeons have used wire, some catgut, and some pins to hold the bones in place. The wire sutures appear to me best for the lower fractures, and the pin for those of the anatomical neck. If there was no tendency to displacement it would probably be safe to rely upon the ordinary dressings to keep the bones in position without suturing or pegging. If the surgeon is not absolutely sure of his asepsis a small drain is advisable, but it may be repeated here that the great danger of the operation is infection, and the surgeon who is not sure of his asepsis should not operate upon such cases.

In all the cases here mentioned the operation was performed at some time in the first month (first day, three cases; second day, two cases; third day, two cases; eighth to fourteenth day, four cases; fifteenth to thirtieth day, seven cases), and the immediate healing of the wound or the functional result does not appear to have been in the least influenced by this factor. Of seven cases operated on in the first three days there was suppuration (slight) in only two. Some surgeons have claimed that the immediate operation is more dangerous on account of the effused blood and contused tissues, and therefore greater liability to infection, but these figures do not bear out this theory. Where the damage to tissues is very great, however, it would be undoubtedly wiser to defer the operation, and also in cases accompanied with considerable shock from the accident or exhaustion from pain. There is usually little risk from this short delay. Of six cases operated on in twenty-

one to thirty days the functional result was good in two, which were reduced, fair in two resected, while suppuration occurred in the other two, causing necrosis in one and in one death.

It is very important to begin passive motion of the joint at the earliest possible moment, and in my cases it was begun ten to fourteen days after the operation. In cases of resection the patient can be allowed to move the arm as freely as he will after the wound has healed. In the reduced cases the first motions should be made by the surgeon on the same principles as in simple fractures near joints, and voluntary motion not allowed until consolidation is well advanced. In fracture of the anatomical neck voluntary motion such as can be made under a shoulder-cap and with the arm in an ordinary sling can be allowed after the third week, but in fracture of the surgical neck it is well to postpone it until five weeks have elapsed. But even in the latter cases passive motion after the third week can be made as freely as may be done without pain. The importance of early motion is to be emphasized, for it not only prevents adhesions but avoids atrophy of the muscles. This muscular atrophy is inevitable, and its occurrence partly explains the fact that good functional results are so much more difficult to obtain in cases operated upon more than a month after the receipt of the injury.

CONCLUSIONS.

(1) In fracture of the upper end of the humerus with displacement of the upper fragment from the glenoid cavity, when proper attempts at simple reduction under general anæsthesia have failed, operative measures should be resorted to unless shock, other injuries, or extensive damage to the soft parts about the shoulder justify delay. A delay of from one to four weeks will not impair the result.

(2) Anterior displacements require an anterior incision, subglenoid or posterior displacements require a posterior incision, preferably by Kocher's method.

(3) The head should be restored to its place, if possible, and resection resorted to only when reduction is impossible or would require such extensive damage to the parts, or such pro-

longation of the operation, as to increase the dangers of wound infection or of shock.

(4) Resection will probably give a better result in fracture of the anatomical neck than in that of the surgical, but reduction is to be preferred in both cases.

(5) Asepsis is an indispensable requirement for a good functional result, and these operations must not be undertaken except under aseptic conditions.

(6) Motion should be begun in the joint as soon as the wound has healed, in ten to fourteen days after the operation.

PROLAPSUS OF THE RECTUM IN CHILDREN.¹

By CHARLES GREENE CUMSTON, M.D.,

OF BOSTON.

ALL cases of true prolapse of the rectum will show by inspection of the parts that a tumor projects out of the anus, but the form that this tumor takes will vary greatly from one case to another. The most frequent form is a sausage-shaped tumor, while at other times the mass may be conical, globular, or pear-shaped; a few cases have been reported in which the prolapsed gut was sickle-shaped. The length of the prolapsed portion varies very greatly, and in the mildest types it may not be more than six centimetres in length; but it may reach seventy-five centimetres or more. When a prolapsed rectum is not very long, its circumference is usually proportionately greater, and, in the adult, I have known of a case in which the circumference reached forty centimetres. In all cases the tumor is coated with mucous membrane.

At the base of the tumor there will usually be found a sulcus existing between the mucous membrane of the prolapsed gut and the skin of the anal orifice. This sulcus varies in depth according to whether the case is one of prolapse of the rectum or an invaginated colon, so that by passing the finger along this sulcus the point of inversion may be determined. In some few cases the sulcus is situated so high up that the finger may not be able to reach it. In only a few instances will the mucous membrane of the bowel form a direct continuation with the integuments of the anus, in which case no sulcus will apparently be present, although when operated on it will be found. This fact can be explained if we assume that the lowest part of the rectum has become completely inverted.

¹ Read before the Maine Academy of Medicine and Science, December 11, 1899.

In almost all cases the lumen of the gut may be seen in the centre of the tumor; its shape varies, sometimes being oblong, and, at others, star-shaped, and through which feces and, in some cases, a bloody or mucopurulent discharge makes its exit. An interesting case has been reported in which, at the lower end of the prolapsus, was found a circular, cicatricial stenosis, which had probably been the cause of the prolapsus.

A point which always should be considered is whether or not there is an inclusion of the peritoneum in cases of prolapsus; and, in order to understand it, a few words on the anatomy of the parts may not be out of place. The peritoneum covers the anterior and lateral surfaces of the rectum, and becomes attached to the third sacral vertebra, which is the termination of the ilio-pelvic mesocolon. From the third sacral vertebra the peritoneum descends along the lateral surfaces, then lower down on the anterior of the rectum, and detaches itself from the gut in a curved line, forming a horse-shoe with its concavity directed backward and upward, and then reflects forward onto the bladder in the male, and on the uterus in the female. The terminal portion of the rectum, at least for its lower two-thirds, is consequently extraperitoneal. The bottom of the vesico-rectal and vaginorectal culs-de-sac are situated at about seven centimetres above the anus, and consequently it is easily understood that the tumor formed by the prolapsed intestine must be of considerable size in order that the serous membrane can become insinuated between the two cylinders of gut forming the invagination.

We, unfortunately, have no clinical guide by which we can detect the presence of the peritoneum in the tumor; but it is evident that the portion of the rectum which is surrounded by peritoneum cannot become invaginated in the part situated below without drawing the serous membrane along with it, which consequently would be found at the anterior part of the tumor. Fortunately, this occurrence is certainly rarely met with, because if it were otherwise each time that incision is practised for a prolapsus the peritoneal cavity would be opened.

Another complication that we should also bear in mind is the possibility of the presence of the small intestine in the

invagination, and cases have been known where knuckles of the small gut have become strangulated in the anterior cul-de-sac of the invagination. All writers on this subject have indicated, as a pathognomonic sign, a gurgling sound, such as is heard in ordinary hernia, when the prolapsus has been reduced by digital manipulation ; and Gosselin has pointed out that if the patient is made to cough the anterior aspect of the prolapsus will swell when small intestine is present within it. Allingham has also given another sign, namely, that the orifice which is usually found at the apex of the prolapsus is always directed backward towards the sacrum when this affection is complicated by a hernia of the small intestine, and this sign has been accepted by a large number of authors.

In most works on surgery the writers give, as an etiology of prolapsus of the rectum in children, fits of coughing, difficulty in passing the stools, and a defect in the curve of the sacrum, in which case the intestine is suspended, so to speak, in the midst of the pelvis. We do not wish to say that attacks of coughing or constipation may not be the etiological factor of prolapsus ; but, in our way of thinking, one of the most important causes is certainly *infection*, whether it is produced by a retention of the fæces, or by diarrhœa which is produced by the bacteria of the gut ; and the pathologic changes which take place in the walls of the intestine certainly deprive it of its tonicity and render it lax. Of course, this applies to young children.

In older children and adults the prolapsus is often due to the presence of a polypus, an ulcer, hæmorrhoids, or some other lesion of the rectum ; and, when examining a case of prolapsus, the surgeon should never neglect to ascertain if some one of these lesions is not present.

On account of the friction to which a prolapsus of the rectum exposes the mucous surface of the gut, the latter undergoes more or less change. Aside from the fact that the surface, becoming excoriated, is covered with either a bloody or purulent mucus, or with necrotic threads of epithelium, there exists in a good many cases a complete loss of the epithelial structures, and consequent ulceration. In one case that I have observed there were two extensive abscesses, and in other cases, including

one here reported, polypus-like granulating growths were present. In almost all cases of prolapsus a more or less violent hæmorrhage will take place at some time or other.

The duration of prolapsus of the rectum is very variable. In some cases it may have existed for a few months, while in others the affection may have been present for several years; and we often find young people or adults who have suffered from the trouble since early childhood.

Generally speaking, the majority of cases of chronic prolapsus can be reduced after the patient has been to stool, and in some subjects where the slightest amount of exertion, either sitting or standing, would cause the bowel to prolapse, it could be reduced every time it came down. Of course, this means a great deal of torment for the patient, on account of the continual trouble and annoyance to which he is put. But, nevertheless, it may be said that, in a large number of cases, defecation is rather painful, and, in some cases, incontinence of the fæces may be present, while in others there will be considerable irritation of the bladder, which is harder to bear than the prolapsus itself. Some of these cases of chronic prolapsus recti, which could have been easily reduced in the beginning, become irreducible after a certain length of time, and adhesions form between the two serous surfaces of the intestine. Others become irreducible from the fact that they have become incarcerated by the sphincter ani. In these cases the mucous membrane will be found uniformly swollen, œdematous, very hyperæmic, and of a dark-red to bluish color, or even black, and in some cases gangrene will have already taken place.

Besides the so-called chronic forms of prolapsus recti, there are other cases where the condition commences very acutely and is accompanied by serious symptoms, such as nausea, vomiting, fever, or collapse. In these cases the prolapsed rectum will be found very œdematous, with hæmorrhagic foci on its surface, and, when felt, it will be found extremely cold. The general health of the patient is interfered with in almost all cases. Generally speaking, prolapsus of the rectum is either due to some other pathologic condition of the organ, as we have

already pointed out, or else to some digestive disturbance, and, consequently, in the latter class of cases the patients are apt to be thin and anæmic.

Regarding the diagnosis, it may be said that prolapsus of the rectum, in variable degrees of severity, is frequently associated with hæmorrhoids, so that one affection is frequently mistaken for the other; but where the prolapsus is not very marked, it is usually as easily cured by local treatment as are hæmorrhoids. This applies only to adults, as children and young adults are not liable to hæmorrhoids. In children, prolapsus of the rectum is often produced by polypus growth, whether sessile or otherwise, as well as to all degrees of bowel irritation, ulceration, and chronic infection of the rectum, accompanied by a diarrhœa, ulceration, and other conditions of the gut. It is also met with in cases where, for some reason or other, the anal sphincter is in a state of atony, as, for instance, in cases of rectal fistula, requiring extensive operative proceedings.

Generally speaking, however, a prolapsus of the rectum or the mucous membrane of the anus can hardly ever be mistaken for any other tumor; but the surgeon should make it a point to ascertain the variety of prolapsus present in a given case, especially for the purpose of carrying out a proper treatment. Prolapsus of the mucous membrane is usually present in the form of a cone with its base at the anus, and may be aptly compared to the cervix uteri of a nulliparous female. The finger should be introduced into the orifice present in the centre of the growth, while the thumb is pressed on the outer surface, and between them the two layers of mucous membrane can be made to slip over one another.

When we are dealing with a total and complete prolapse, or invaginated rectum, digital examination will show that the thickness of the tissues is considerably greater than normal, and, still more, it will be evident that the mass palpated has more resistance, and that the two layers of fibromuscular tissue composing the tumor are much larger, and cannot be made to move one over the other with as great facility when we are dealing with two invaginated, intestinal cylinders. The presence of the sulcus, when it exists, is a very good diagnostic

point, because it is never met with when the mucous membrane alone is prolapsed. It is also absolutely necessary to exactly ascertain the height of the invagination, on account of the possible presence of the peritoneum in the anterior cul-de-sac.

Reduction of the prolapse should immediately be applied in order to ascertain whether there is any immediate danger of strangulation. If the history of the case is wanting, the duration of the existence of the prolapsus may be estimated by its dark-red color, or even by the dermatoid aspect that the mucous membrane takes on when it has been submitted for a long time to friction by the clothing.

The prognosis of prolapsus of the rectum is never really serious, and, if the affection be treated from the beginning, a cure will usually result. The only serious condition which may arise is when strangulation and resulting gangrene take place.

As in this paper it has only been the intention of the writer to report those cases of prolapsus recti which were really of the severe type, and which required an extensive operation, the three following cases will be reported, and the simpler forms which required medical treatment only will be omitted:

CASE I.—William C., aged three and a half years, was brought for treatment to the Tremont Dispensary in May, 1896. The father and mother are both well, and three other children are in excellent condition. The mother stated that for about two years she had noticed, as she expressed it, a red bunch at the anal orifice, but recently this growth had increased considerably in size, and the child complained of much pain when he went to stool.

Examination showed a cylindrical tumor measuring about five centimetres in all its dimensions; it was of a rather dark-red color, and at the most prominent part an orifice was seen, which gave issue to a liquid *fæces*. Careful digital examination failed to reveal the presence of a polypus or other morbid condition of the rectum, and a diagnosis of prolapsus recti was made. The prolapsus could be reduced easily. When the finger was introduced into the rectum and the prolapsed portion seized between this finger and the thumb, the tissues were found very thick, indicating that the prolapsus was

total. Around the anus there was a sulcus measuring about two centimetres in depth.

After proper preparation of the bowel, five longitudinal lines were made with the thermocautery, care being taken to only destroy the mucous membrane of the gut, which was then reduced, after having been covered with a layer of dermatol ointment.

The child was brought back to us about six weeks later, as the mother had found that the tumor returned, and was as evident as before the cauterization, so it was decided to perform a radical cure. After a profound ether narcosis had been obtained, the tumor was grasped on each side at its lowest part with a pair of artery-forceps. On the left side an incision was made with the scissors, extending up the entire length of the tumor, and then, with the scissors, all the parts forming the hernia were excised at the base. The mucous membrane was sutured to the skin with fine silk. We then proceeded to excise a triangular bit of mucous membrane and skin at the posterior aspect of the anus, which was then sutured with silk.

The sutures were eliminated spontaneously eleven days after the operation, and the child was discharged cured. He was seen about four months after the operation, and no recurrence of the trouble had taken place.

CASE II.—Mary C., aged nineteen months. Both parents are alive and well, as are six other brothers and sisters. The patient was born at term and labor was normal. The child was well until about the age of three months, at which time she presented certain signs of irritability, and also diarrhœa. The diarrhœa lasted for a number of weeks, although the patient was under the care of a physician, and during this time the rectum was noticed to protrude at each stool, its extent being about two centimetres. The attending physician ordered that the rectum be reduced each time it prolapsed; but this was not of much avail, and every time the child would cry, the abdominal pressure would cause the prolapsus to protrude more and more, so that finally it became of considerable size.

Although the child was situated in very favorable surroundings, its general health was not good, and it did not make the proper weight. For the last four months, the motions have been regular and well formed, but the patient is very restless, and cries every time the bowels move, especially when the fæces are hard. For the last four months, the prolapse has, apparently, not increased, and at present it measures about fourteen centimetres long. It can be re-

duced with only the greatest difficulty, and reduction causes great pain to the patient. The surface of the mucosa is covered by numerous granulations, and is of a dark-violet color. As gangrene appeared imminent, immediate operation was advised and accepted by the parents.

After the child was etherized, the prolapsus was thoroughly disinfecting, and Mikulicz's operation was carried out as in the descrip-



FIG. 1.—Prolapse of the rectum, Case III.

tion of the technique, which will be considered later on in this paper. No hernia of the small intestine was found, and the peritoneal cavity was closed with a running suture of fine catgut. After the slight hæmorrhage had been controlled, the mucous membrane was stitched to the anal skin with interrupted chromic catgut sutures, seven of these being necessary. The child made an uneventful recovery, and three weeks after the operation was playing about, in fine spirits.

When seen about eight months after the operation, the condition of the anus was excellent, and no return of the trouble was evident.

CASE III.—This case was under my observation in the service of Professor Julliard, of Geneva, and represents the most complete prolapsus of the rectum that I have ever seen. It was a child about six years old, who had had this condition of affairs present ever since babyhood, and which had been allowed to run on until the rectum hung down and reached the level of the popliteal space, as this photograph (Figure 1) will show. Circular resection of the rectum was performed, the borders of the gut were united to the anal skin, and recovery was uneventful.

In the large majority of cases, prolapsus of the rectum in children will readily yield to medical treatment if instituted early. The judicious use of a rubber rectal-plug to keep the prolapse reduced, cleanliness, and tonic treatment with the use of strychnine will, probably, give the best of results. If the prolapsus has for etiological factor a polypus, hæmorrhoids, or other local lesion, it is very evident that the surgeon's efforts should be directed towards the cure of the latter, and generally, after this has been accomplished, a proper medical treatment will do away with the prolapsus, if it is not too far advanced.

When a prolapsus has reached a certain stage, when it has become irreducible, or when it has become constricted by the sphincter ani and gangrene is imminent, resection of the prolapsed part is the method of choice.

The preparation of a patient for the operation is similar to that employed in all operations on the intestine. A complete evacuation of the bowels by the use of laxatives and enemas is necessary, but, of course, if we are dealing with a case where the gut has become strangulated from constriction of the anal sphincter, the use of purgatives or cleansing enemas cannot be resorted to. A few hours before the operation, I like to have tincture of opium given in sufficient quantity to quiet the intestines during, and for some little time after, the operation. The field of operation is thoroughly disinfected, and, during the operation, the free use of mild antiseptics, when necessary, should be resorted to. The patient should be placed in the lithotomy position.

As to the technique of the operation, it varies very greatly, and almost every surgeon has devised some method of his own. Some produce an artificial anæmia by applying a rubber tube around the base of the tumor, and this is prevented from sliding off by transfixing the gut with a long needle, just as is done in Wyeth's amputation of the hip-joint. The prolapsus is then sutured to the circumference, five or six sutures usually being enough, and then the tumor is simply removed by scissors or knife. Hæmorrhage is extremely slight. Raye and Volkmann operate in this way, with the exception that they do not resort to artificial anæmia; they both suture the bowel first, and then perform resection below the line of sutures. Volkmann stitches the mucosa of the anus and that of the rectum, which is situated a little higher up, with a fine stitch. Raye, not being satisfied that he had closed the abdominal cavity by means of his circular sutures, thought it more prudent to peel back the peritoneal cul-de-sac very carefully off the gut, and then ligated it at its neck with catgut, cut off the sac thus formed, and allowed it to retract into the pelvis, and by doing this he dealt with a condition just as we do in the radical operations for hernia.

Some French surgeons, especially Nélaton, Segond, and Trelat, employ a somewhat different technique; their chief point being to operate with as complete an artificial anæmia as possible. Two long clamps are placed parallel to each other and side by side on each half of the prolapsed gut, so that one blade of the forceps is placed within the lumen of the prolapsus, while the other remains outside. The gut is then slit open between the clamps in its entire length up to the anus, the result being that the prolapsus is divided into halves, forming an anterior and posterior flap without any hæmorrhage whatsoever; Nélaton divides the prolapsus laterally, making two lateral flaps. Next comes the resection of the two flaps, and the introduction of the sutures. The resection is carried out in such a manner that the clamps are first applied across the base of the flaps, and then resection is carried out by slowly snipping the gut across with scissors, a suture being inserted after each snip. Péan operated on a case where he first divided the prolapsus into an anterior and posterior flap, but he did not

use clamps, employing the rubber tube at the base of the tumor instead.

Treves first endeavors to ascertain the exact nature of the tissues entering into the formation of the prolapsus before resection is done. He does not resort to any form of artificial anæmia, but immediately proceeds to make a circular incision, which simply includes the external mucous membrane, which is carried to the apex of the prolapsus by folding it back like a cuff and attaching the latter; one is thus enabled to obtain a good view of the tissues entering into the formation of the prolapsus. Only after this has been done, resection of the gut is performed by means of small incisions of about two centimetres long, after which forceps are applied until entire resection has been accomplished. The application of the forceps not only prevents hæmorrhage, but also retains the intestine, which cannot glide back out of reach. When resection has been completed, the forceps are removed one after the other, each bleeding vessel being caught up and tied with catgut, and union of the edges of the gut is accomplished by carefully applied silk sutures.

Mikulicz first cuts through the outer intestinal tube in its anterior circumference by cutting the tissues, layer after layer, catching up each bleeding vessel as it appears, and ligating it with fine catgut. As soon as the peritoneal pouch has been opened, its interior is examined for the presence of small intestine. The peritoneal cavity is then closed by a running suture. The anterior aspect of the internal intestinal tube is cut through little by little until it is opened, and then both intestinal tubes are united by deep silk sutures to the entire line of the incision.

The posterior circumference of the prolapsus is treated in absolutely the same way, both intestinal ends being united by means of silk sutures, and thus the resection is completed. Mikulicz's method has been followed by Billroth, Nicoladoni, Bogdanik, Heinecke, Natlakowski, and Helferich, with the exception of Billroth, who, instead of closing the peritoneal sac, left it open and drained. Mikulicz advises against packing the rectum after the operation, as he considers that all dressings placed in

the lumen of the rectum are superfluous, and under certain circumstances may be even dangerous. He simply covers the line of sutures with iodoform, and then places a strip of iodoform gauze over this, which is then in turn covered by a wood-wool cushion, and this is the dressing that I have used. It should be changed every day, or oftener if necessary.

Much attention must be directed to keep the surfaces very clean, and for this purpose a daily irrigation with a mild antiseptic solution, such as boracic or salicylic acid, is of value. Opium should be given internally for about a week following the operation, in order to keep the bowels bound up, and of course the patient must be kept upon a diet that will leave as little intestinal residue as possible.

Now, as regards the various techniques which I have described, I would say that the production of artificial anæmia, either with the clamps, as employed by the French surgeons, or with the rubber tube placed around the base of the tumor, in my opinion are both dangerous and useless. If a man is any kind of an operator, he can certainly easily control the slight amount of hæmorrhage that may occur. The great danger from the use of the clamps or the rubber tube lies in the fact that there may be a hernia of the small intestine, and this we never can diagnosticate with surety until the peritoneal cul-de-sac has been opened. Treves's technique does not appear to us either necessary or particularly advantageous. In our opinion by far the best method to follow is that described by Mikulicz, which has already been detailed. This method can be applied to every case of prolapsus, whether it be small or large, whether it is complicated with intestinal hernia or not, and in all cases the peritoneal cavity can be closed off perfectly. At the same time the operation is simple and easily performed, and in all reported cases the hæmorrhage never amounts to much.

We would also point out that resection of a triangular piece of skin and mucous membrane at the posterior aspect of the anus is a very good complementary operation in those cases where we wish to give greater support to the parts, as was done in Case I.

In the majority of cases recovery after operation for prolapsus recti is simple, and the wound closes in most cases without any reaction; but care must be taken to carefully place the stitches, including tissue enough to prevent them from tearing through. A medium-size silk is perhaps, on the whole, the best material, but a good chromic catgut may sometimes be preferred. In cases of invagination, silk is perhaps the best material to employ.

If diarrhœa should supervene, as it sometimes does, opium in full doses must be exhibited. It is better to keep the bowels confined until about the eighth day, and after this time a daily movement should be obtained. In most cases the passage of the fæces will not produce any pain or loss of blood, and only in very few cases will the operation be followed by fæcal incontinence, which usually will right itself within a short time. Bladder symptoms rarely complicate the convalescence, but occasionally retention of the urine will occur, which lasts a few days. Union of the wound takes place quite rapidly, and generally the patient may be discharged during the third week. In some few cases the process of repair may require a somewhat longer time.

Death from the operation is extremely rare, as far as I can learn; and if the subjects when operated on are found to be in a good general condition, I believe that the mortality ought to be *nil*.

In all the cases with which I am familiar, the result as to the functions of the bowel were excellent, and the disease is not likely to recur if the operation has been properly performed. The movements from the bowels become again normal in every respect, and I am aware of no instance in which incontinence of fæces was present. In those cases where a relaxed sphincter ani was present before the operation, recovery from this infirmity took place, the sphincter regaining its normal tone. I know of no case in which stricture occurred after the operation.

Whether these good results have remained permanent in all cases is impossible surely to say, and a recurrence of the prolapsus may possibly take place, but in all probability the result is permanent.

As I have endeavored to point out, resection of the rectum in cases of prolapsus or invagination is the proper treatment where a faithfully tried medical treatment has been without avail; but in the milder forms, before resorting to this, it is well to try the thermocautery, making several longitudinal incisions, care being taken not to extend deeper than through the mucosa of the rectum. If the result is not satisfactory, then I think we should resort to a resection; but, like everything else in surgery, it is far better policy and judgment to first try the simpler methods at our disposal, and if these fail more radical methods should be adopted.

Within the last few years other operations have been proposed and executed for the relief of the more serious types of prolapsus recti, one of which is due to Jeannel, which he terms colopexia, or by Verneuil colopexotomy. Jeannel makes an incision over the left Poupart's ligament, as is done in Littre's operation of colotomy. The descending colon is then searched for and is drawn up into the wound until the prolapsus is completely reduced. The gut is then stitched to the incision in the abdomen, and then a few days afterwards it is opened in order to obtain an artificial anus. This artificial anus is closed later on, after the adhesions have anchored the bowel securely in place.

In our opinion, however, resection of the prolapse is to be preferred to this method because colopexia is by far more complicated than the former operation, and, besides this, resection can be performed at one sitting, while in Jeannel's operation several interferences are necessary. Besides, it is very disagreeable for a patient to go about with an artificial anus, and all surgeons are fully aware of the difficulty which frequently arises to close an artificial anus. The treatment necessitated by colopexia requires at least from three to four months, while in resection of a prolapsed rectum it is safe to say that the patient will be completely cured by the end of three or, at the latest, four weeks. I do not believe that colopexia presents any greater or surer guarantee of an ultimate recovery than does resection; and it is also evident that the former cannot be indiscriminately performed on each and every case. For instance, if we are dealing with an irreducible prolapsus, if the

gut is in a gangrenous condition, or a stenosis of the lumen of the rectum is present, it is evident that colopexia is out of the question, and resection is the only operation which will meet the demands of the case; but it may be said that, in a case where resection should fail to effect a cure, colopexia might be tried as a last resort.

Of the other methods which have been proposed, I will say nothing, as they appear to me both dangerous and devoid of common sense; and, in conclusion, I would offer the three following propositions:

(1) In the acute types of prolapsus recti and invagination of the colon which are irreducible, and which, at the same time, present other serious general symptoms, such as incarceration, gangrene or intestinal obstruction, no time should be lost; the surgeon should act at once, and this means immediate resection should be performed.

(2) In all cases of chronic and irreducible prolapsus ani, although they do not directly threaten life, they should be removed as soon as possible, because at some future time they will probably be a danger for the patient. These chronic irreducible prolapsus are very prone to impair the general health of the subject, because they interfere with proper nutrition. Rather frequent and somewhat profuse hæmorrhages are liable to occur in these cases, which may be the means of rendering the patient quite anæmic; they frequently become incarcerated, and the consequence is either an inflammation of the rectum or even gangrene. Owing to the fact that this form of prolapse is exposed to external influences of a dangerous nature, extensive ulceration, especially at the apex of the prolapse, cicatricial stenosis of the lumen of the rectum may occur. And, lastly, a hernia of the small intestine into the prolapse may arise. Now all these dangers can be prevented by an early resection, and the earlier this is done the better, because the patient will be in a far better general condition than if the surgeon waits until called upon to operate in haste after some one of these above mentioned complications have set in.

(3) In all cases of chronic reducible prolapsus recti which cannot be cured by milder therapeutic measures, resection is

indicated. I would strongly advise giving medical means only sufficient time to ascertain if any result whatever is to be obtained by them, because in this form of prolapsus the dangers will become considerable the longer the case is allowed to run. If linear cauterization is tried and remains without result, it had better not be repeated, because cicatricial stenosis will certainly occur.

REPORT OF RESULTS OBTAINED IN THE TREATMENT OF UNUNITED FRACTURES WITH THE PARKHILL CLAMP.

By ALBERT L. BENNETT, M.D.,

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NINE cases of perfect union out of fourteen cases operated for ununited fractures encourages me to report my experiences with the Parkhill clamp. In 1897 it was my good fortune to be present at operations in Denver, Colorado, when Dr. Clayton Parkhill commenced using his bone-clamp for the treatment of ununited fractures. As I was about to depart for Africa, Dr. Parkhill afforded me abundant opportunity for observing the results obtained in cases upon whom this clamp had been used. He also presented me with a complete clamp, and later, while in London, I had two smaller sets made. The largest size I have used for operations on the femur, the second size for the tibia and humerus, the third size for the fibula, radius, and ulna.

This instrument has been fully explained and illustrated in the *ANNALS OF SURGERY*, of May, 1898. Since my return from West Africa I have learned from Dr. Parkhill that he has been using a steel pin as a guide when drilling holes in the bone, so that the second hole drilled may be parallel to the first. I consider this steel guide of much help and, therefore, of value. In my first two cases I had considerable difficulty and delay, owing to the fact that I did not drill the holes parallel, and changes had to be made which prolonged the operation beyond the time necessary. I also regret that I did not have the clamps silver-plated; had this been done, the antisepsis would have been more thorough and the instruments better preserved from rust in the damp atmosphere of Western Africa. In every case where I succeeded in accurately adjusting the

clamp I found perfect fixation of the parts, excepting those cases suffering from specific or tuberculous disease.

The fourteen cases here reported were all males, belonging to different tribes of the Bantu family of negroes in German and French West Africa. The age obtained from these patients is always approximate. The fourteen cases which I operated are herewith reported in brief.

CASE I.—Fracture of left humerus. M. B., aged twenty-five years. One year before seeing me the patient had been struck with an axe-handle over the left arm, causing a fracture of the humerus in its lower third. This fracture was comminuted, and a small sinus had formed, from which pus could be pressed. Fibrous union existed. Operated July 9, 1897. Upon cutting down to the bone two small fragments were found and removed. Fibrous union separated and ends of bone resected. Parkhill bone-clamp applied, second size being used. The uprights were not parallel and new holes had to be drilled. No plaster-of-Paris. To control the patient was impossible, or to keep him clean: he removed the dressings on every possible opportunity for the purpose of showing the projecting portions of the clamp to his friends, and to explain how brave he was in permitting a white man to "put him asleep and cut him." One day he disappeared in the bush; he returned in five days with all dressings off, but the clamp in position; the wound was badly infected. The patient excused himself to me by explaining that he "washed it daily in a forest stream." New dressings were applied, but the infection persisted. Finally, the patient insisted upon the clamp being removed. Union had not taken place. Patient departed to his home.

CASE II.—N., aged sixteen years. Recent fracture of right femur. Patient slipped while walking along a fallen tree in the forest. Fracture at junction of upper with middle third. Operated July 26, 1897. Oblique section of ends. The Parkhill clamp, large size. Silkworm-gut sutures were used to close wound. The limb was kept in a fracture-box, clamp removed at end of fifth week. Good union. Used one crutch for three weeks and left hospital with crutch. This patient was seen four months later at a town nearly ninety miles from his home. He had walked the entire distance with his father, and had not used any support except a light native throwing-spear.

CASE III.—M. Z., aged twenty-six years. Pseudarthrosis of the left humerus. Patient had been shot in a palaver (tribal war) in

January, 1896. A compound comminuted fracture existed at the upper fourth of the bone. The soft parts had been badly damaged and infected and a running sore existed. Operated August 9, 1897. Two pieces of iron pot and one small stone (native bullets) were removed. Ends resected transversely, the Parkhill clamp applied. Wound sutured with silkworm-gut; gauze drain. Drain removed third day. Dressings changed, wound healing nicely. Plaster-of-Paris dressing. Clamp removed at end of fifth week. Good union; very useful arm.

CASE IV.—A man belonging to the Benga people, living on Corisco Island, aged twenty-five years, was brought to my hospital. An examination revealed an ununited transverse fracture of right femur in its middle third. Bone fractured in February of same year. The tilting of the upper fragment upward was very marked and caused considerable pain. Operated September 20, 1897. Free incision. Adhesions were cleared away, ends of bone sectioned transversely, and clamp fixed in position. Wound sutured. After applying dressings, the limb was well protected with wadding and then enveloped with plaster bandages and placed at rest in an ordinary fracture-box. Case removed on fifty-sixth day. Perfect union. Patient rested quietly in his town two months, and then went on a hunting trip in the forest.

CASE V.—Male, Bulu tribe, aged forty years. Malunion of left tibia. Patient was badly infected with syphilis; the nasal bones having already collapsed. He had several syphilitic sores. For several days I refused to operate him; but he pleaded so hard for operation that I finally consented, and on October 26, 1897, applied the Parkhill clamp, after sectioning the fibula. Patient placed on anti-syphilitic treatment. Clamp removed at end of fifth week. No union whatever.

CASE VI.—Male, Mabeya tribe, aged thirty years. Ununited oblique fracture of right femur at junction of upper and middle third. This patient was in a very similar condition to Case V. He was badly infected with syphilis, and was also suffering from pulmonary tuberculosis. Examination of his sputum revealed large numbers of tubercle bacilli. For the restoration of the fractured bone the Parkhill clamp was applied November 4, 1897. Patient did not do well; considerable fever developed, and his pulmonary distress increased from date of operation. The anæsthetic (ether) undoubtedly caused the marked bronchial irritation experienced the first three days after operation. It became necessary to remove the clamp on the thirty-fourth day. No union.

CASE VII.—Boy, aged fifteen years. Fracture right humerus. Two weeks' standing. Operated November 20, 1897. Clamp applied. No unusual occurrence. Clamp removed thirty-nine days after operation. Perfect union. This patient seen constantly for months after operation.

CASE VIII.—Female, Bulu tribe, aged thirty-six years. Pseudarthrosis of right humerus. The bone was fractured in its lower third, from a blow inflicted by her husband with a heavy wooden club, used for pulverizing cassava (native food). November 25, operation. Clamp applied. All dressings removed December 30. Perfect union.

CASE IX.—Male, aged forty-five years, Benga tribe. Recent compound comminuted fracture of left humerus, caused by a gunshot wound, December 6, 1897. Fragments of bone removed. Ends of fractured bone resected. Wound thoroughly cleansed with antiseptic solution and clamp applied. January 20, 1898, clamp removed; a very good result; union complete.

CASE X.—Male, aged thirty-five years, Benga tribe. Two years before presenting himself for operation, this patient, while working on a coasting steamer, fell through an open hatchway and sustained an oblique fracture of the right femur at the lower and middle third junction. He left the ship and was treated by a native doctor. Very marked malunion existed. January 25, 1898, I operated this man. It was necessary to use the chisel to separate the malunion. The ends of the fractured bone were then sectioned. The large size clamp was used, and the tissues sutured around the instrument as practised by Dr. Parkhill. This limb was put up in precisely the same manner as Case IV. Although there was considerable reaction following the operation, the patient went on comfortably, and dressings and clamp were removed at end of the sixth week. Union was perfect, and patient, when last heard of, was again working on a steamer.

CASE XI.—Male, Fang tribe (a witch doctor), aged twenty-nine years. This patient had been shot in a palaver, and sustained a compound comminuted fracture of right humerus in the lower third very close to the elbow. The patient was also suffering with syphilis. Operated April 2, 1898. He took the anæsthetic very badly, and was kept under with difficulty. The fracture was so near the elbow-joint (about one inch and a quarter) that the clamp was adjusted with difficulty, and the final adjustment was not correct. No union was obtained after waiting thirty-two days.

CASE XII.—Male, Bakele tribe, aged twenty-eight years. Compound fracture of femur in upper third. Upper portion of the bone

projected through the septic wound, maggots were crawling out of the medullary canal. The stench from the wound was very bad ; altogether it was a horrible sight. Two days previous to operation this bone and wound were very thoroughly cleansed and repeatedly injected with antiseptic solution. Operated April 5, 1898. Large size clamp used. The result was very satisfactory. Absolute union was obtained by end of eighth week.

CASE XIII.—Male, aged twenty years. Fracture of right tibia at junction of upper and middle third. (Patient suffering with pulmonary tuberculosis.) Operated April 21, 1898. The second-size clamp was used. At end of sixth week no union.

CASE XIV.—The last case I had the privilege of operating upon for ununiting fracture in Africa was that of a Yungvol man, aged twenty-two years. The patient had received a full charge of shot (broken old iron pot) in the right arm, resulting in a compound comminuted fracture of the humerus in its upper third. The wound needed careful antiseptic treatment for six days prior to operation. Operated May 2, 1898. The fragments were sectioned transversely, second size clamp used, rubber drainage-tube inserted and wound closed. Drainage-tube removed second morning. Patient did very well. A sharp attack of tertian malaria kept him back, but perfect union was obtained by end of tenth week.

To bear testimony relative to the efficiency of this bone-clamp is to me a sincere pleasure, for, situated as I was in a far-off uncivilized land, having to work under most disadvantageous conditions, and with absolutely untrained assistants, the results obtained with this instrument for the restoration of fractures was, to say the least, extremely gratifying. I found that where properly applied, and all other conditions being equal, the clamp fulfils all Dr. Parkhill claims for it,—*i.e.*, it is easy of adjustment. After proper adjustment, motion between the fragments is not possible.

In operations conducted in strictly aseptic lines the risks of infection are extremely small ; and lastly, but by no means of least importance, obviate the necessity of secondary operation.

A CASE OF ACUTE OSTEOMYELITIS OF THE FEMUR,
WITH GENERAL SYSTEMIC STAPHYLOCOCCUS
AUREUS INFECTION, TERMINATING
IN RECOVERY.¹

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GUSSIE P., a child of eight years of age, was admitted to the Mount Sinai Hospital on July 27, with the following history: Five days previous to his admission he had fallen and struck himself in the neighborhood of the left gluteal fold; he was able to walk home immediately after the injury. The next day he experienced considerable pain in the region of the hip-joint, with chills and fever. The pain and fever continued, some swelling appeared in the region of the hip-joint, and the boy was unable to move the joint. On admission, late at night, his temperature was 105.6° F.; pulse, 120; respirations, 26; and the physical examination gave the following data:

Lungs.—Harsh friction râles over both chests heard with inspiration and expiration.

Heart.—Sounds distinct, no change in the cardiac area.

Liver.—Slightly enlarged, extending one finger's breadth below the free border of the ribs.

Spleen.—Normal to percussion and palpation.

Abdomen.—Everywhere soft, except in the left groin, where the psoas muscle was very tense and painful.

Left Lower Extremity.—Lay in the inverted position. Very slight swelling of the upper part of the thigh; no shortening; trochanter major occupied the normal position; genital folds normal; no pain on pressure over the hip-joint, quite severe pain in the upper part of the thigh. Over the inner part of the thigh, from Poupart's ligament downwards, the muscles were tense. On rotation of the thigh

¹ Presented to the Harlem Medical Society, October 9, 1899.

at the hip-joint there was a marked reflex muscular spasm, extremities otherwise normal. Urine normal.

When I saw the boy the next morning his temperature had fallen to 103.4° F., but the local signs remained about the same. Vague and scanty as these local manifestations were, I considered the child was suffering from an acute osteomyelitis of the femur, in the neighborhood of the upper epiphysis, and for the following reasons: The hip-joint itself was not distended by any fluid. Impact of the head of the femur against the acetabular cavity did not cause pain. This lack of distention and absence of joint tenderness excluded disease of the joint itself, whereas the local pain, the tenseness of the psoas muscle, and the reflex muscular spasm elicited by rotation of the thigh, indicated, in the absence of any disease of the ilium, an inflammatory affection of the femur due to the traumatism he had sustained.

I therefore immediately proceeded to cut down upon the femur at its upper end, making my incision through the soft parts at the outer side of the limb. The periosteum was found to be attached to the bone, and the cortex of the latter bled when the periosteum was separated from it. No pus was found either at the epiphysis or subperiosteally. As the temperature had been declining since the child's admission to the hospital, I deferred opening the marrow canal for twelve hours, until I could determine whether the inflammation was regressing.

After the operation the patient was still very restless and delirious; he complained of considerable pain, and his urination was involuntary. The temperature and pulse rate continued high, 102° F. to 103.4° F., and 122 to 124 respectively. The next morning I therefore opened the marrow cavity, and found therein a few drops of pus and fluid fat. A culture was taken from the medullary cavity, and also one from the blood of the forearm. The medullary cavity was thoroughly curetted and drained, and the entire wound dressed wet and left open. The poisoning of the patient seemed so intense, that, without waiting for a bacteriological report, I ordered the boy to be given the antistreptococcic serum. That night he was given two injections of the serum, —one of ten cubic centimetres at nine o'clock, and one of five cubic centimetres at midnight.

On July 30, the night of the second operation, the child slept at intervals; he did not complain of any pain, and was very quiet. Temperature, 101.8° F., to 103.6° F.; pulse, 120 to 162; respirations 26 to 42. Free catharsis and diuresis was established, and the antistrep-

tococcic serum was continued, two injections being given daily of ten cubic centimetres each. The bacteriological report of the cultures was as follows:

Culture taken from the bone marrow was sterile, and it remained so during a period of observation of seven days.

Culture taken from the blood, two cubic centimetres, showed the presence of a pure culture of staphylococcus aureus. This finding was confirmed by a second culture of the blood made on August 2, three days later.

During the next few days the constitutional symptoms continued with nearly the same intensity, *i.e.*, the temperature remained about 101° F. to 103° F., the pulse rate between 140 and 160. On August 2 the antistreptococcus serum was stopped, and the unguentum Credé substituted therefor. The wound was moist, and pale, flabby granulations commenced to appear.

August 8.—During the past week there was little change in the constitutional or local manifestations. The temperature remained high, varying between 101° F. and 105° F., the pulse rate continued very rapid, 120 to 140 per minute. A Widal examination of the blood gave a negative result. The urine showed no diazo reaction. Physical examination gave the following result:

The Left Chest.—In the axillary line, from the fourth space downward, and in the scapular line, from the angle downward, there was flatness to percussion, no vesicular murmur, no fremitus. This flatness was continuous with splenic flatness, and merged in front with cardiac dulness. The spleen was just palpable beneath the free border of the ribs. The right chest showed no abnormality. There was slight pericardial frictions, especially to be heard at the base. The apex beat was not displaced. These physical signs in the absence of any pulmonary lesion led me to suspect a metastatic focus of suppuration in the left subphrenic space, and accordingly, on August 11, I aspirated under chloroform. I first aspirated in the ninth intercostal space in the scapular line, passing my needle through the diaphragm into the subphrenic space, but the aspiration proved negative. I next aspirated the pleural cavity in the eighth space, but with a like result. I also aspirated in the anterior axillary line, in the sixth space, with the intention of entering the anterior aspect of the left subphrenic region, but obtained no pus. I sent the boy back to bed without further procedure, to watch subsequent developments.

On August 15 the constitutional symptoms continued with equal intensity. The kidneys were commencing to secrete very little urine,

twelve to fourteen ounces daily, although the child took a large amount of fluid and solid nourishment; the urine was of a specific gravity of 1004, contained no albumen; the urea was normal. The physical signs in the left chest continuing about the same, and the temperature being suggestive of a metastatic focus of suppuration, I determined to again explore with the needle. Aspiration in the same regions as before yielded again practically negative results,—a little bloody serum being obtained from the left pleural cavity. The pericardial sac was also aspirated, and a little serum withdrawn.

On August 18 a specimen of urine was drawn from the bladder with a sterile catheter, and into a sterile tube, and sent to the laboratory for bacterial examination. The bacteriologist reported the presence of the staphylococcus aureus therein. Subsequent examinations of the urine, on August 21 and 23, showed no staphylococcus aureus, although observed for seven days.

On August 22 the pericardial friction sounds had disappeared, and the physical signs in the left chest had regressed considerably, the lung coming down to almost the limit of the pleura. The urine was of low specific gravity, 1002, contained one per cent. of urea, and was slightly more abundant. The wound was covered with pale, flabby granulations.

On August 28 the examination of the blood proved it to be sterile, after a period of observation of seven days. The constitutional symptoms had moderated considerably. The temperature did not rise above 101° F., the pulse still remaining about 120. The kidneys were secreting very little urine, and there was developing general anasarca, ascites, and hydrothorax. The liver was very much enlarged, extending downward, almost to the level of the umbilicus. There was also considerable tenderness over the liver.

On September 2 the liver remained very large and tender, and under chloroform I made an exploratory aspiration, with negative results. Aspiration of the pleural cavities yielded clear serum. As the kidneys were functioning very badly, and not responding to any of the methods of treatment at our command, and presuming that the same swelling which affected the liver and spleen was also present in the kidneys, and it having been urged also that there was a possibility of cortical abscesses in these organs, I cut down upon the right kidney with the dual purpose of splitting its capsule and thus relieving its tension, and also of exploration. The kidney was found to be swollen; exploration of its cortex gave a negative result as to suppuration. The cortex was pale, and I excised a wedge-shape piece for

pathological exantination. It was reported as being the seat of *acute inflammation and degeneration*.

On September 3 and 4 there was no change in the patient's condition; his temperature was still about 100° F. to 101° F., pulse rate 130; the urine was still very slight in amount, eight to ten ounces per day, the anasarca becoming more marked. On September 5, three days after the splitting of the capsule of the kidney, he passed twenty-two ounces of urine, and thereafter, up to September 10, he passed from twelve to fourteen ounces daily, a gain of about six ounces over the previous amount. His urine never contained casts.

On September 10 the nephrotomy wound had healed. The patient's general condition was about the same, his temperature about 100° F.; pulse 120; marked ascites and hydrothorax, and general œdema. He took considerable nourishment at all times. On that day his mother insisted on removing the child to her own home against our advice.

Subsequent History.—The trip home from the hospital weakened the boy very much, and he was in a very precarious condition for a week following. He passed very little urine, but continued to take considerable nourishment. About six days after his return home, he commenced to pass large quantities of urine; and this excessive urination continued until his abdomen became entirely flat, and his legs and body generally had returned to their natural contour. He gained rapidly in health and strength, and the physical examination on December 3, 1899, gave the following data:

Child is still anæmic, but fairly well nourished, and of fair intellect.

Lungs.—Normal in every respect.

Heart.—Area not enlarged. Apex beat in normal situation. No friction sounds. Heart sounds clear and distinct.

Abdomen.—Flat.

Liver.—Not enlarged. Dulness extends from fourth rib to the free border.

Spleen.—Normal.

Kidneys.—Urine normal in amount (estimated) and in character.

He had regained his health entirely. There were no physical signs in the chest pointing to any abnormality; the liver and spleen were of normal size; the abdomen was perfectly flat; the urine was normal in every respect; the boy walked straight; and the femur had entirely healed. The heart sounds were clear and distinct; the apex beat in its normal position; and no friction râles could be heard.

Boy walked well. Femur has healed entirely. The bacteriological examinations of the blood and urine were carried out by the assistant pathologist of the hospital, Dr. Libman.

Comments.—This patient came into the hospital suffering with an acute infectious osteomyelitis due to the staphylococcus aureus, and induced by the traumatism he had sustained. That no germs were found in the culture taken from the medullary cavity was most probably due to the fact that that particular droplet of serum which was taken up in the loop of the needle happened to be sterile. I am convinced, that had several different droplets been taken, the staphylococci would have been found. The infection of the blood was undoubtedly from this primary focus in the bone, and the good effects of the operative procedure were seen at once in the subsidence of the pain and cerebral manifestations. Although the local symptoms had been relieved, the general septicæmic state still continued, due to the infection of the blood by the organism and its toxins. I wish, here, to call attention to the fact that, although only five days had elapsed since the original traumatism, and only four days since the first manifestations of the disease, yet general systemic infection had already occurred. Now, as regards the use of the serum in this case, I have already before this Society stated my opinions as to when the serum can be expected to be of any value,¹—viz., only in those cases where there is an infection of the blood with the organism itself,—and I have also stated that if any good is to result from the serum, it must be used very early. In this boy I suspected general infection, and, without waiting for a bacteriological report of the blood-culture, I at once put him upon the antistreptococcic serum. The next day the pathologist reported that the blood showed the presence of the *staphylococcus aureus*. I should at once have put the child upon the antistaphylococcus serum, but, having commenced with the former, I decided to continue its use. Whether or not it had any influence I am unprepared to say, but certain it is that *no metastatic focus of suppuration* developed in this boy dur-

¹ The Treatment of Pyogenic Osteomyelitis.—*Philadelphia Monthly Medical Journal*, July, 1899.

ing the period of almost seven weeks that he was under my observation, in spite of the fact that there were virulent pyogenic organisms circulating in his blood. It might be argued, "of what value can the antistreptococcus serum be in staphylococcus infections?" This can be answered by mentioning the work lately performed by Emmerich and Low. They proved by experiments on guinea-pigs that the pyocyaneus enzymes were capable of neutralizing the effects of the diphtheria toxines; and have even gone so far as to urge the use of "pyocyanose" (the enzymes of the bacillus pyocyaneus) in the treatment of diphtheria in the human subject, in place of the diphtheria antitoxin. Furthermore, as bearing upon the same subject, it is only necessary to recall the long, well-known fact, that the enzymes of pyocyaneus work antagonistically to the anthrax organism and its toxines. This antagonistic relation of the enzymes of one organism to bacteria and toxines of different species has been recognized also in the manufacture of the antistreptococcus serum; where the animal whose serum is to be used has been injected with several varieties of both the streptococcus and staphylococcus, such serum being known as the "mixed serum."

My use of the unguentum Credé was not founded on any rational basis, but was given in a desperate case where every therapeutic procedure should be made use of. I do not consider that it had any influence upon the course of the disease.

Now, as to the effect of the organism, or its toxines, on the viscera of the patient. This is well seen in the pericarditis, the acute degeneration of the kidneys, and the acute degeneration of the liver and spleen, as manifested by their enormous size. The physical signs which led me to aspirate the left subphrenic region I can account for only by the enlargement of the spleen upward instead of downward. The numerous punctures that I made relieved the congestion of this organ, just as the splitting of the kidney capsule relieved the congestion of the latter, and thereby diminished its size, which accounts for the disappearance of the physical signs. What became of the organisms in the circulating blood is well shown by their presence in the urine in almost pure culture, and their excretion in the urine is

still further illustrated by their disappearance from it when the blood itself became sterile.

When the boy left the hospital his toxæmia and his blood infection had disappeared. He was then suffering from the effect of these two factors upon his organs, viz., the acute inflammation and degeneration of the viscera.

To Recapitulate.—The points worthy of notice in this are as follows :

(a) An infection of the medullary cavity of the femur by the *staphylococcus aureus*, induced by his traumatism.

(b) An early blood infection by the same organism and its toxins.

(c) The use of the *antistreptococcus serum*, and the absence of any *metastatic focus of suppuration* in a *staphylococcus infection*.

(d) The subsequent elimination of the organism by the kidneys.

(e) The effects of this organism and its toxins upon the viscera, as shown by the acute degeneration and inflammation of the latter.

COCCYGEAL DERMOID FISTULA.¹

By ROBERT T. MORRIS, M.D.,

OF NEW YORK.

THE subject of coccygeal dermoid fistula has apparently received little attention in literature.

Occasionally some one has reported the finding of a dermoid cyst in the coccygeal region, but without making satisfactory explanation for the derivation or manner in which such cysts are likely to have been formed. I have seen reference to cysts only, but in making a study of the subject it seems to me that we are more apt to find fistulæ than cysts. We are still more apt to find funnel formed depressions than fistulæ. These congenital defects in the coccygeal region are so common that one will not examine many patients without finding some one form of the defect, most commonly the funnel formed depression in the skin extad to the coccyx. Less frequently we find fistulæ extending to the depth of from half an inch to four inches, as in my most marked case, the deepest portion of the fistula cephalad from the exit situated in the loose connective-tissue layer between the sacrum and the skin. The rarest form of the defect would appear to be the wholly encapsulated cyst; but this may be because such cysts are often so small as to be overlooked. The coccygeal fistulæ and cysts contain straight hairs of the lanugo type mostly, although I have found some that were nearly three inches in length, straight, and welded into a cylindrical mass by sebaceous material. The sebaceous material escapes freely from the fistulæ, and when decomposing may have a very disagreeable odor. It remains encapsulated in the cysts, and in the funnel shaped depressions it frequently dries upon the surface of the skin and comes away in the form

¹ Read at the meeting of the American Association of Obstetricians and Gynecologists at Indianapolis, Indiana, September 20, 1899.

of thick scales mixed with epithelial *débris*. When my attention was directed to the subject about a year ago, I was surprised at finding so large a number of these cases which evidently represent some embryonal defect. There is a possibility that the tail of the embryo in undergoing involution leaves a portion of the skin highly endowed with embryonal latent cells, and that the skin developing more perfectly around the site of the embryonal tail encapsulates the remains of this structure in



FIG. 1.—Section of fistula wall from coccygeal dermoid fistula (low power).

part or in whole, so that we have in a coccygeal fistula really an inverted tail. I have found four cases of coccygeal fistulæ containing masses of hair, in my own practice, up to the present time. In trying to eradicate these fistulæ, it is essential that the entire fistula wall be removed, because it consists so largely of embryonic tissue that we shall have recurrence of the fistula if any part of the wall be left, very much as in the case of branchial cysts. The method of treatment with nitrate of silver

and other caustics is as unsuccessful as similar treatment of branchial cysts, because of the difficulty of destroying the cyst wall by any method short of complete excision.

The patient from whom the micro-photographs were obtained (Figs. 1 and 2) was a young man twenty-three years of age. He had not been aware of anything wrong in the coccygeal region until about two years previous to the time when I first saw him. He was kicked, and following the kick there had developed a small tumor-like mass

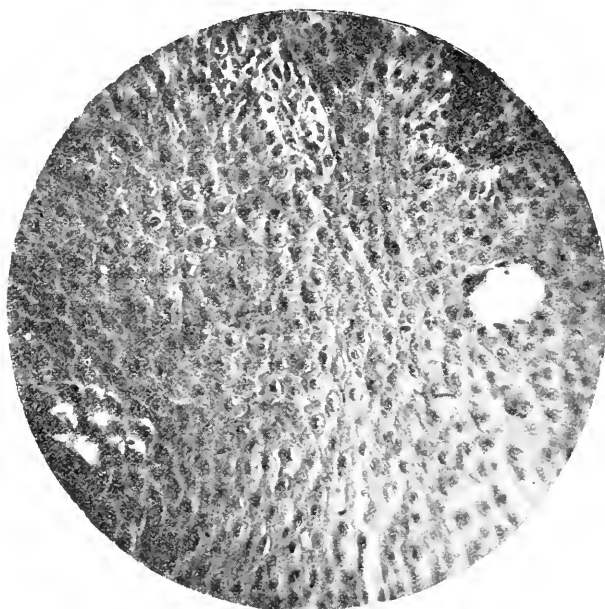


FIG. 2.—Section of fistula wall from coccygeal dermoid fistula (high power), showing character of epithelium.

in the coccygeal region. His physician brought him to me on the supposition that injury had been done to the bone, and that the case was one of necrosis of the coccyx, but I recognized the odor of the sebaceous secretion from the fistula and found two or three projecting hairs. I dissected out the fistulous tract, which was about three inches in length, and the specimen from which these photographs were made was taken from a middle segment of the fistula wall. The coccyx in some of these cases seems to be deformed, but I am not sure that this

is a good observation, because I have not had an opportunity to examine post-mortem any coccyx in a case with fistulæ, cysts, or funnel depressions. I presume that this young man had a small congenital coccygeal cyst; the exit closed by epithelial agglutination, very much as in a case of preputial adhesion, the imperfectly developed epithelium cells not well stratified, and the cells intermingling in such a way that cleavage between the opposed portions of fistula wall was not readily effected until the patient received a blow in this region, when there was such an addition of serous elements to the sebaceous contents of the cyst that the fluid forced an opening at the point of least resistance and established an open fistula.

On examining sections of the fistula wall taken from a middle segment of the pipe that was removed, we observe that the fistula wall consists of almost typical skin, but containing an enormous number of blood-vessels with extensive infiltration of cells like leucocytes. The epithelial surface is arranged rather irregularly, and the hairs are shed almost as rapidly as they become fully developed, so that only a few hairs remain firmly attached to the skin within the fistula. They are shed in such a way that they remain longitudinally compressed against each other, and a mass that I removed from one patient was about as large as my finger in length and in circumference. In most of these cases, when there is an escape of sebaceous material, we find a disagreeable odor.

REPORT OF A CASE OF RECOVERY AFTER GASTRECTOMY FOR CARCINOMA.¹

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INASMUCH as the stomach is frequently the seat of malignant disease, its early recognition, if surgical treatment shall be applied, is imperative. Cancerous affections appearing in other regions of the body have long ago been handed over to the surgeon the moment suspicion was aroused concerning its character.

Total extirpation of the growth in its earliest stage, if possible before regional involvement has taken place, is conceded by all to be the only treatment.

The diagnosis of carcinoma of the stomach, if a tumor can be felt, is comparatively easy, but the instances in which a neoplasm can be mapped out are unfortunately more than common.

The case under consideration gave the following history on entering the Troy Hospital on May 11, 1899. Woman, aged forty-six years; married; six children; father died of tuberculosis; mother and seven sisters alive and well; no history of malignant disease; never had any serious illness; present trouble began November, 1897, with fulness in the epigastrium, eructation of gas and burning in the stomach. Pain was an early manifestation; was relieved after taking food, but returned again in the interval of her meals. The pain caused her sleepless nights; she often sat up in bed stooped over, making pressure on her stomach, which seemed to relieve her. She had little or no vomiting at first, and never vomited blood at any time. In May, 1898, she discovered a mass in the epigastrium, which gradu-

¹ Read before the Albany County Medical Society, November 15, 1899.

ally increased in size. Loss of flesh and strength from now on was quite apparent. In March, 1899, she began rejecting her food, and rapid emaciation was the consequence. Sleep was difficult to obtain on account of the pain, and for which, so far as she knows, she never took anodynes. Obstinate constipation throughout. No urinary disturbance except scantiness.

May 12, 1899.—Examination: The patient presents an exceedingly emaciated appearance. Muscles soft and flabby. Skin dry, and countenance decidedly weary. Abdominal wall thin. On inspection of abdomen, a rounded mass occupying the epigastrium is indistinctly seen. On palpation, a well-defined tumor, quite resisting and not particularly movable, lies between the ensiform cartilage and the umbilicus, and sensitive on manipulation. The pain and continuous vomiting had compelled her to take to her bed. Her physical state was such that a comparatively short time under the existing circumstances must terminate her life.

Although little hope of relief from an operative stand-point presented itself, I decided, at the request of the patient and her husband, to make an exploratory opening, which I did on May 15, 1899, in the presence of Drs. Barnes, Fairweather, O'Brien, and Gravatt. The abdominal wall was thin; practically no adipose layer. On reaching the peritoneum, it was found adherent to the mass. Careful division of this layer for a short distance permitted us to introduce the finger and separate the adherent surfaces. The peritoneum was then opened corresponding to the length of the incision in the abdominal wall, which was about three and one-half inches. The stomach was found to be the seat of the disease, but its attachments to the surrounding parts were so intimate that further progress with the operation seemed inadvisable.

A loop of intestine, with intervening omentum, was found adherent to the stomach wall on the side of the greater curvature, midway between the cardiac and pyloric orifices, and in effecting its separation its lumen was lacerated through and required suturing.

The condition of the patient at this time was extreme, and I decided to abandon further work; but as after transfusing the patient and administering stimulants he rallied somewhat, I continued. When the gastro-hepatic and gastro-colic omenta were divided, serious adhesions were found existing posteriorly between the tumor and the great vessels. Trusting, however, that these might be dealt with, I divided the duodenum as near to the entrance of the bile-duct as was com-

patible with effecting a safe anastomosis, the pylorus being distinctly involved in what seemed to be a malignant process.

The divided duodenum was held with a gauze sponge and the pyloric orifice clamped. The pylorus was lifted up, and the process of liberating the adhesions begun. All bleeding points were ligated with catgut, and finally the entire organ was delivered through a comparatively small incision.

The excision of the mass was made above the area of apparent involvement, which was one inch from the cardiac end on the side of the lesser curvature, and about one-third of an inch on the side of the great curvature.

The walls at this point were, however, greatly thickened, and contained areas of apparent infiltration. This remaining portion was removed with scissors, and the entire stomach in consequence taken away.

The œsophagus, which was inclined to retract, was secured with sutures and held down. A number of enlarged glands were dissected out, and all tissue bearing evidence of regional infection was removed.

The task of making a satisfactory anastomosis was now to be thought of, and the duodenum was, without much difficulty, brought in apposition with the œsophagus, and, after securing the parts with catgut, a final row of Lembert silk sutures completed the operation.

The peritoneum was closed with plain catgut, and chromicized catgut for the abdominal wall.

The entire time consumed, from the first incision until the abdomen was closed, was one hour and five minutes. There was little or no loss of blood.

May 15.—Patient went to etherizing-room at 9.30 A.M., and returned to the ward at 12.15 P.M. Vomited a small quantity of dark-brown fluid. Continued very restless during the entire afternoon and night, and occasionally eructated a mouthful of dark-brown liquid. Was given strychnia, one-thirtieth of a grain, hypodermically, every three hours; whiskey, peptonized milk, beef-juce, per rectum, every four hours. Temperature, 6 P.M., 100.4° F.; pulse, 96.

May 16.—Vomited, on an average, every four hours, a small quantity of dark-brown material, having at times a distinct fæcal odor. Great pain in mid-dorsal region, coming on intermittingly, subsiding after a few hours. Patient becoming more comfortable, and securing one hour's sleep at intervals. Rectal enemata, consisting of beef-juce, panopeptone, white of eggs, and whiskey, given to the point

of toleration, which were retained. Hypodermics of strychnia, one-fortieth of a grain, every three hours. Temperature, 8 A.M., 100° F.; pulse, 108; 7 P.M., temperature, 100.2° F.; pulse, 94.

May 17.—Patient very comfortable and cheerful; nausea and vomiting entirely controlled. Nutrient enemata, consisting of eggs, panopeptone, beef-juice, peptonized milk, and whiskey, every four hours. Temperature, 9 A.M., 100° F.; pulse, 120; 7 P.M., temperature, 99.2° F.; pulse, 102.

May 18.—Slept considerably; is very comfortable; bowels moved; complained of colicky pains, which passed off on expelling a large amount of flatus. Nourishment kept up in same way, and hypodermics of strychnia continued. Temperature, 9 A.M., 98.4° F.; pulse, 94; 6 P.M., temperature, 100° F.; pulse, 104.

May 19.—Complains of great hunger and thirst. Tablespoonfuls of water given frequently, which caused no discomfort. Nutrient enemata continued. Strychnia given by mouth. Temperature, 9 A.M., 98.4° F.; pulse, 92; 6 P.M., temperature, 99.4° F.; pulse, 102.

May 20 to 22, inclusive.—Very cheerful; more comfortable than in many months, securing a natural amount of sleep. Has had no anodynes since the operation. Given freely of water, an ounce at a time, but no nourishment allowed by mouth. One stool fairly normal. Temperature normal; pulse ranging from 86 to 92.

May 23.—Allowed nourishment by mouth for first time,—beef-tea, milk, and water, one ounce alternately every two hours. Wound examined and found perfectly healed. The temperature normal; pulse 90.

May 24.—Slept well during the night; very cheerful. Breakfast, soft-boiled egg, slice of toast, and one cup of tea. Same for dinner. Took during the day and night thirty-two ounces of milk, one small cup of gruel, and two ounces of beef-tea. Temperature normal; pulse 84.

May 25 to 31, inclusive.—Continued to take milk in large quantities, eggs in different forms, toast, beef-juice, and tea. The history otherwise uneventful. Bowels moving daily and natural.

June 1.—Breakfast, milk toast, poached eggs, coffee four ounces, one glass of milk. Dinner, broth, four ounces, toast, poached egg, tea, and one glass of milk. One pint of milk taken during the day in addition to above. Temperature normal; pulse 80.

June 2.—Breakfast, milk toast, poached eggs, baked potato, coffee one cup. Dinner, soup four ounces, crackers, roast beef, mashed potatoes, and ice-cream. In addition to this, patient took

liberally of milk. Subsequent to this date she was given regular meals without restriction, and experienced no inconvenience whatever.

June 7.—Sat up for one hour. No pain; some slight sense of dragging in the epigastrium. Continued to sit up every day, becoming much more cheerful, increasing rapidly in strength. Appetite good, and no distress following the ingestion of food.

June 25.—Left the hospital after taking a dinner consisting of roast beef, mashed potatoes, ice-cream, cup of coffee, and one glass of milk.

Report of DRS. GEORGE BLUMER *and* H. O. FAIRWEATHER,
Pathologists.

Specimen is one of stomach removed at operation by Dr. Harvie. There is present in the specimen about four-fifths of the entire organ, together with about three centimetres of the duodenum.

The organ itself is much contracted, and measures 14 x 6 x 5 centimetres. It is covered by a smooth, pinkish-white membrane, and the blood-vessels are plainly marked.

Along the lower border of the organ are the remains of the line of attachment of the greater omentum, which has been cut away. Along the lesser curvature are the remains of the line of attachment of the lesser omentum.

About three centimetres of the duodenum are present, and has an opening three and one-half centimetres in diameter. Through this opening the pyloric valve is distinctly seen, with a circular opening one centimetre in diameter. There is a line of constriction on the posterior wall of the organ, midway between the cardiac and the pyloric portions, and extending from the greater to the lesser curvature. This area of depression is 1.5 centimetres below the level of the rest of the stomach at its deepest portion. At this point the stomach wall is extremely dense and firm, and has a white refractive appearance, the tissue appearing to be cicatricial tissue.

In the greater omentum, along its attachment at the point of depression, there are to be seen two or three enlarged lymph-glands, firm in consistency, ranging from eight to ten millimetres in diameter, and of a homogeneous gray-white color. These glands appear to be infiltrated with a new growth.

The enlarged lymphatic glands show varying changes in different portions of their substance. In some places the lymphatic structure is replaced by a dense area of connective tissue. In other places the gland structure is replaced by a new growth, which is of an alveolar type and consisting of small alveoli filled with epithelial cells similar to those already described in the stomach.

The walls of the organ vary in thickness from normal to 1.5 centimetres. The entire stomach wall is thickened, with the exception of a

somewhat circular area, measuring four centimetres in diameter, and situated adjacent to the pylorus and along the greater curvature.

The mucosa of the thickened portion of the stomach wall varies in appearance in different places.

The area of greatest thickening corresponds to the outside groove above mentioned, and at this point the stomach wall is approximately one and one-half centimetres in thickness. This area of extreme thickness begins at a point three centimetres from the pylorus, and terminates four centimetres from the amputated edge of the organ. It completely encircles the organ over an area five and one-half centimetres in width.

Occupying the centre of this zone, and directly overlying the point of greatest depression of the external groove, is an almost square area of ulceration, measuring two and one-half by two centimetres. This has rather abrupt edges and a smooth, clean base.

The area of greatest thickening mentioned above completely surrounds this ulcer.

On section of this thickened area no definite new growth is shown, but a well-marked hypertrophy of all the coats of the organ. In the less thickened portion of the mucous membrane, also, there seems to be merely a hypertrophy of the mucous membrane and muscular tissue.

Anatomical Diagnosis.—Carcinoma of the stomach, originating in the floor of an old ulcer. Metastases to the omental glands.

Microscopical Appearances.—The portion of the stomach wall corresponding to the area of greatest thickening shows marked changes in all its coats. The mucous membrane shows in its deepest layer, immediately adjacent to the muscularis mucosa, collections of small, round lymphoid cells, of a sharply circumscribed character. The centres of some of these contain clear areas, made up of large epithelial cells and containing a few polynuclears, which resemble the germinal centres normally seen in the lymph-glands. The muscularis mucosa is markedly hypertrophied, but otherwise retains its normal type. The submucosa is also greatly thickened, and is much more compact than normal, being made up of rather dense connective tissue, containing a moderate amount of spindle-shaped cells and many thin-walled blood-vessels. The muscular coat shows the most marked change.

Only occasionally can patches of muscle be made out, almost the whole of the muscularis tissue having disappeared, and its place being taken by a rather dense connective tissue, similar to that just described in connection with the submucosa.

This connective tissue, which takes the place of the muscular coat, is directly continuous on the one hand with that replacing the submucous coat, and on the other hand with that of a much thickened peritoneal coat of a similar character.

In a few places of that portion of the connective tissue, corresponding to the deeper layers of the muscular coat, there can be made out small

alveoli containing cells of an epithelioid type. These cells are irregularly round or oval, have a vesicular nucleus and a moderate amount of protoplasm.

The portions of the stomach wall which show less marked thickening exhibit essentially the same changes, the degree of change being less. In those areas the muscular coat is much better preserved, and the amount of new formed connective tissue much smaller.

Microscopical Diagnosis.—Same as anatomical.

The successful cases of Dr. Carl Schlatter, of Zurich, Dr. Charles Brooks Brigham, of San Francisco, and Dr. Maurice Howe Richardson, of Boston, have shown the possibility of removing the stomach in its entirety, without apparently causing any interference with nutrition. Stimulated by the knowledge furnished by these surgeons, I am able to report another successful case of gastrectomy.

Notwithstanding the fact that this operation is one surrounded with the heaviest responsibilities, and may at times assume difficulties in its execution which will tax the ingenuity of the most experienced, it would seem that in all cancerous states, where the conditions are at all favorable, that radical procedures should be recommended. When a diagnosis can be made that such a process is at work, the surgeon can only look forward to one termination, and therefore should shoulder the responsibility of doing work (which up to the present writing is surrounded with the highest mortality of perhaps any other operation) that may result in a permanent cure, or, if not, may bring about an amelioration of the difficulty and prolong life.

When the operation for the extirpation of a malignant growth in any other part of the body is undertaken, we do not regard it in high favor unless it can be attended to early. The moment it ceases to be a local issue and regional involvement occurs, brilliant results and lasting benefit will be the exception.

Most of our stomach cases have been operated when the patients have been exhausted and worn out by the inroads of the disease. If these cases could be secured when the new growth is in its infancy, I venture to say that the showing would be vastly changed. This assertion has, I think, been sufficiently

exemplified in the successful cases recorded, all of which were very far advanced.

In our time, when the simple opening of the abdomen means so little, would it not be well to inspect directly all cases which possess a suspicious manifestation, and, if found operable, do radical work, just as is done in the breast and uterus, for instance? There are few states calling for more sympathy than the trying ordeal of a slow death from carcinoma of the stomach. The pain which is always present is only one of the many symptoms which makes the patient's remaining days those of misery.

When my patient entered the hospital, her weight was 79 pounds; on August 15, 100 pounds. This was certainly a substantial gain. She left the hospital June 25, 1899, after partaking of a dinner consisting of roast beef, mashed potatoes, one glass of milk, ice-cream, and a small cup of coffee. Her appearance was one of happiness, and her feelings those of perfect comfort, every vestige of stomach distress having vanished. The only inconvenience which she speaks of is a sense of pulling in the epigastrium, when she lies perfectly flat on her back, with her legs straightened out, which is possibly due to the tension caused by the junction of the duodenum and the œsophagus. On returning to her home she immediately assumed the responsibility of her household work, attending to all its details except washing.

TWO CASES OF CICATRICIAL STRICTURE OF THE ŒSOPHAGUS TREATED BY GASTROSTOMY, THE "STRING" METHOD, AND PERMANENT DILATATION BY ELASTIC TUBES.¹

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CASE I.—A boy, two years of age, in October, 1897, swallowed some lye, producing a cicatricial stricture of the œsophagus. Notwithstanding systematic and thorough use of bougies, the contraction continued until the stricture barely admitted a bougie one-eighth of an inch in diameter.

In May, 1898, the writer did a gastrostomy by the old-fashioned method, and at the same time succeeded in dilating the stricture somewhat by means of a string which was passed from the mouth through the wound in the stomach (Abbe's method). This string was left in place for three or four weeks, and the stricture gradually dilated by bougies until it admitted a bougie one-quarter of an inch in diameter. The narrow portion extended from six to ten inches from the front teeth. The boy then left for his home in the country, and dilatation was practised very irregularly; in consequence of this, recontraction occurred. The child was admitted to my service at St. Luke's Hospital during the fall of 1899, the stricture being barely passable to a bougie one-eighth of an inch in diameter. On September 21, 1899, the fistula in the stomach, which had closed spontaneously, was reopened under ether anæsthesia. The stomach having been sewn to the abdominal wall at the first operation, it was only necessary to cut away the thin cicatricial tissue and partly detach the adhesions in order to expose a considerable part of the stomach wall. The stomach was then opened, the finger introduced, and a bougie passed downward through the mouth was caught by the finger and directed out of the gastric fistula. To this a string was attached and

¹ Presented to the New York Surgical Society, October 25, 1899.

drawn up out of the mouth. The opening in the stomach was closed around a catheter by purse-string sutures (Stanim's method). Five days later, under ether, the stricture was enlarged by bougies and by cutting with the string until it admitted a bougie one-quarter of an inch in diameter. A rubber tube, about one-third of an inch in diameter, was then drawn through the stricture under considerable tension, and allowed to remain *in situ* for about a week. This method of dilating an œsophageal stricture is a modification of von Hacker's method of using drawn-out rubber tubing. A piece of Chinese braided silk is passed through a piece of rubber tubing, and two large knots are tied in the silk at a distance apart equal to twice the length of the rubber tube. The knots and the intervening silk are coiled up inside of the tube, and both ends of the latter are tightly bound around the silk beyond the knots with a strong thread. Tension on the silk now stretches the tube, because the knots prevent the silk from slipping out of the tube, and that part of the silk within the tube is double the length of the latter. The tube can thus be drawn out to twice its length, which will reduce its diameter in proportion. The tube was arranged in this manner on the silk cord already in place in the stricture, and then strongly stretched by pulling on the cord, and drawn part way through the stricture, and allowed to remain there. When tension was released, the tube expanded and tended to dilate the stricture. The tube completely blocked the œsophagus, and, while it was in place, the patient had to be fed through the fistula; this complete occlusion of the œsophagus gave rise to a little discomfort on account of the regurgitation of saliva, but had no other evil effect. After removal of the tube in five or six days, it was found that considerable dilatation of the stricture had taken place, and the child now takes a bougie of 30 French (Charrière) urethral size. The string is still in place.

(NOTE.—February 1, 1900, bougie, 34 French, passes easily, none having been passed for three weeks, the gastric fistula contracted and closed spontaneously in November.)

CASE II.—A girl, nine years old, drank caustic potash in May, 1898, and was brought to me first in January, 1899, with symptoms of a stricture of the œsophagus of moderate extent. A bougie, one-eighth of an inch in size, passed with difficulty; but the obstruction appeared to be due to a curve in the canal rather than its small calibre, for the swallowing of semi-solid food was comparatively easy. Further dilatation with bougies proved unsuccessful. The patient was lost sight of during the summer, and by September the stricture had

contracted to such an extent that even a filiform could not be made to pass through, although the patient swallowed enough milk and fluid food to maintain her nutrition. Gastrostomy was thereupon done at St. Luke's Hospital, August 8, 1899. When the stomach was opened, after an unsuccessful attempt to locate the lower œsophageal opening by instruments and by the finger, a Kelly rectal speculum, about one inch in diameter, was introduced into the stomach, and, upon inspection through this, it was found that the region of the cardiac orifice was marked with a thick, white scar, in the centre of which was a small opening which admitted the tip of an ordinary silver probe for half an inch. The opening was so small that it could not be seen until milk had been injected into the œsophagus by a catheter passed down to the stricture through the mouth. A filiform bougie passed only a little further than the probe, and nothing could be passed through the stricture from either direction. The stomach wound was closed by interrupted silk sutures down to its lower angle, in which a catheter was inserted. The stomach wall was then inverted and drawn together by purse-string sutures, as in gastrostomy by Stamm's method (*Medical News*, September 22, 1894). The patient was nourished through the gastric fistula, and improved very much in health. On September 12 she was again given ether, and after many trials and much delay a filiform bougie was passed from the mouth into the stomach, its end drawn out of the gastric fistula by a fine forceps inserted into that opening, and a silk thread attached, and thus drawn up through the stricture to the mouth. By passing bougies and sawing with the string, the stricture was enlarged, and a rubber catheter, No. 15 French, was passed and left *in situ*. On September 19, a rubber tube, about one-third of an inch in diameter, was passed through the stricture under tension, as described in the previous case, and left there for four days. On September 26, this was followed by the introduction, under ether, of a still larger tube, and on October 9, a tube about five-eighths of an inch in diameter was passed, and remained in place four or five days. It finally slipped into the stomach, and was removed through the fistula. The child now takes a 28 French bougie through the mouth, and is able to swallow, practically, everything. The gastric fistula still remains patent, and the string in place.

(NOTE.—November 8, 1899. The string has been removed and the fistula closed spontaneously. February 1, 1900, a bougie, 34 French, can be passed easily, no attempt at dilatation having been made for ten days.

The points of especial interest in these cases are the use of rubber tubing under tension, the maintenance of the strings in place for so long a period, and the efficiency of the purse-string gastrostomy. The gastric fistula practically did not leak even with the string passing through it, and was damaged only temporarily by dragging through it the rubber tube, half an inch in diameter, when the latter had slipped down into the stomach.

The purse-string method used was that recommended by Stamm, of Cleveland (*Medical News*, September 22, 1894, p. 324), after experiments on dogs.

Stamm inserted a catheter through a small opening made in the stomach, and then inverted the wall of the latter in a funnel-shaped manner by a couple of purse-string sutures surrounding the opening. The first suture is passed about half an inch from the edge of the opening, the needle picking up only the outer coats of the stomach, making a complete circle around the opening. The stomach wall within this circle is inverted, and the suture tied so as to pucker up the tissues around the catheter. A similar suture is then passed half an inch from the first and secured in the same way. The result is a nipple-like protrusion of the wall of the stomach inside that organ around the catheter, which will act as a valve and prevent any escape of contents when the tube is withdrawn. The gastrostomy fistula made in this manner will close spontaneously when it is no longer required. The method was based upon the suggestion of Witzel for securing an automatic closure of the gastrostomy fistula by folding in the stomach wall, but is much simpler than Witzel's method.

Kader's method, in which Lembert sutures are used and a straight fold made, was not described until 1896 (*Centralblatt für Chirurgie*, 1896, p. 665), and his first operation was done in January, 1895. E. J. Senn first operated by the method known by his name in August, 1896 (*Journal of the American Medical Association*, xxvii, p. 1143), but it does not seem so practical as the others, the stomach wall being drawn out between the purse-string stitches instead of being inverted. Stamm's method is by far the simplest, and the results are satisfactory.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 22, 1899.

The President, B. FARQUHAR CURTIS, M.D., in the Chair.

NEPHRECTOMY FOR RENAL CALCULUS.

DR. ALEXANDER B. JOHNSON presented a woman, aged thirty, married, multipara, the last child born ten years ago, who was admitted to the Surgical Ward of the Roosevelt Hospital on September 18, 1899.

Her health had been gradually failing for seven or eight years. From time to time she had suffered from chilly sensations and soreness in the lower part of the abdomen, with frequent and painful urination. Six months before she had had a tolerably sharp chill, accompanied by vomiting and pain in the median line of the belly over the bladder. At this time she also began to suffer from frequent and painful urination, not relieved by irrigation of the bladder. Recently she had complained of slight pain and tenderness over the region of the left kidney, but not of sufficient intensity to cause more than a mere sensation of discomfort. She had never had hæmaturia, nor anything resembling an attack of renal colic. She had lost much flesh and strength.

Palpation of the abdomen revealed nothing abnormal but slight tenderness in the left lumbar region. The left kidney could not be felt.

The patient was feeble and anæmic, neurasthenic, and mentally depressed. Temperature, 99° F. ; pulse, 104, and feeble.

She complained greatly of constant pain in the urinary bladder, and urinated with great frequency day and night. The urine was cloudy, acid, of diminished specific gravity, and contained a large amount of pus. No tubercle bacilli, but many cocci.

September 27.—The patient was placed in the lithotomy position ;

the bladder was irrigated repeatedly and thoroughly with boric acid solution until the fluid returned without apparent contamination or admixture of pus. Cocaine was then introduced into the urethra, and after an interval of eight minutes the bladder was again thoroughly irrigated and emptied. Harris's double catheter was then introduced, and in the course of half an hour about a drachm of rather thick pus was collected from the left side.

A drachm or more of urine was collected from the right side. This specimen also contained numerous flocculi of pus. This examination having proved unsatisfactory, the patient was chloroformed, placed in the exaggerated lithotomy position, the urethra was dilated, and one of Kelly's specula was introduced into the bladder.

The orifice of the left ureter was easily recognized by the appearance of intermittent gushes of moderately thin pus. The metal catheter was then introduced into the right ureter, the speculum withdrawn, and the catheter tied in place. In the course of the following six hours three ounces of clear urine were obtained from the right kidney.

The specimen was of normal specific gravity, and contained no pathological ingredient other than a few red blood cells. Following this examination, the patient suffered on the next day from a rather threatening attack of syncope.

On account of her generally enfeebled state, operation was postponed until October 10, stimulants being administered meanwhile, when she was etherized, and a cut was made one inch below and parallel to the last rib, extending from the edge of the rectus in front to the outer border of the erector spine behind. The kidney was exposed behind the peritoneum; the organ was moderately enlarged and firmly adherent to its fatty capsule. It was normal in shape, and palpation of the organ gave the signs of fluctuation. Blunt enucleation with the hand was made without difficulty and the pedicle exposed.

The renal vein was isolated and surrounded by a catgut ligature; a heavy clamp was placed upon the renal artery and left *in situ*. The kidney, with its ureter still attached, was cut away from its remaining attachments. The ureter was divided with scissors three inches from the kidney.

The condition of the patient at this time was not very good, although but little blood had been lost, and she was given an intravenous salt infusion of 1000 cubic centimetres at a temperature 118° F. into a vein at the bend of the elbow.

The ureter, which appeared to be only moderately thickened and dilated, was cauterized and ligated with catgut.

Irrigation of the wound was followed by deep and superficial sutures of catgut and silk respectively, except for one and one-half inches at the posterior angle, where a piece of aseptic gauze was inserted for drainage, and where the handle of the artery-clamp was allowed to protrude. Aseptic gauze dressing.

The kidney measured five by three by two inches. A section along its convex border opened into a series of abscess cavities containing thin, reddish-yellow pus. In the centre of each abscess cavity there projected a prolongation of a stone whose central mass occupied the pelvis of the kidney, with another pointed prolongation extending downward into the ureter. The stone consisted of a central mass about one and three-fourths inches by one and one-half inches by one-half of an inch, which occupied the renal pelvis and the beginning of the ureter. From the central mass there projected six secondary processes from one-half of an inch to one inch in length, and from one-third of an inch to three-fourths of an inch in diameter, which occupied the centres of the several abscess cavities. The greatest length of the entire stone measured two and one-half inches. The weight of the stone in its dried condition was approximately 250 grains.

Its surface was rough; it was moderately hard, somewhat brittle; it appeared to consist of urates.

The kidney was largely converted into a series of pus sacs, except at one pole, where a considerable mass of kidney tissue remained in a condition of chronic inflammation. The sacs were for the most part rather thin-walled.

Upon exposure of the organ in the wound it was noted that while fluctuation was distinct, yet the fluid contents were under no great tension, drainage through the dilated ureter having remained free, which might account for the failure to detect any very evident enlargement of the organ upon physical examination. The almost complete absence of tenderness appears, however, unusual.

The convalescence of the patient was uneventful; she suffered no rise of temperature above 100° F.

The clamp upon the renal artery was removed at the end of forty-eight hours, and the wound healed *per primam*, except for the drainage sinus, which soon became clean and gave no further trouble. The patient's bladder was irrigated after the operation daily with a weak solution of potassium permanganate 1-3000 G.

The painful and frequent urination from which she had suffered rapidly passed away, and was entirely gone at the end of the month, and at present her urine is clear and free from abnormal ingredients. No considerable diminution of the twenty-four hours' quantity was noted as the result of the operation, and at the present time, forty-three days after the operation, she has gained greatly in health and strength and seems to be in good health.

The case is one of those in which a kidney lesion gives symptoms referable chiefly to the urinary bladder.

DR. WILLY MEYER said that several years ago, following the advice of a Russian surgeon, he resorted to the clamp method in six consecutive cases of nephrectomy. In five instances the clamp was removed at the end of forty-eight hours, and in one at the end of seventy-two hours. There was no trouble, and all the cases ended in recovery. Shortly afterwards, Dr. Meyer said he was asked to see a young lady, the daughter of a colleague, who was suffering from tuberculosis of the left kidney. A nephrectomy was done at the patient's home, the operation proving extremely easy. The clamp was employed, and left *in situ* for forty-eight hours; then, with the usual precautions, it was slowly loosened and extracted. Its withdrawal from the wound was immediately followed by a profuse hæmorrhage. This was checked by firm, continuous pressure until the renal artery and vein, after considerable unavoidable delay, were exposed; the walls of the vessels were gangrenous, and again ligated with considerable difficulty. A saline infusion was then given. Death occurred from acute sepsis seventeen hours later.

Dr. Meyer said that since the occurrence of the unfortunate accident in the case above reported he had discarded the use of the clamp, and he never could be induced to employ it again, in ordinary cases, where ligation of the pedicle was well feasible. Previous to the experiments just related, he had looked upon it as a safe and simple method of expediting the removal of the kidney.

DR. FRED. KAMMERER said that the only reason he could see for applying a clamp was the inability to pass a ligature properly and tie it, owing to a short pedicle or a very large kidney. He saw no objection to the temporary application of a clamp, which could be removed after the kidney had been cut away and replaced by ligatures.

DR. JOHNSON, in closing, said that usually, in extirpating the kidney, he was in the habit of applying a ligature to the artery and vein, separately, but occasionally, as in the case he reported, where

time was of much consequence, the patient being in poor condition, he found it more convenient and time-saving to use the clamp. The clamp has been frequently employed at Roosevelt Hospital by Dr. McBurney and other surgeons, and the speaker said he was unaware of any case where a secondary hæmorrhage had resulted from its use.

TETANUS TREATED BY INTRACEREBRAL AND INTRAVENOUS INJECTIONS OF ANTITETANIC SERUM.

DR. ALEXANDER B. JOHNSON presented a man, aged thirty-one years, who came under his care through the favor of Dr. Frank B. Petersen, of Cutchogue, L. I., on the evening of October 19, 1899, with the history that on October 11 he had accidentally scratched the ulnar surface of his left forearm by sliding it across the top of a fence, which formed a portion of an enclosure used as a pig-pen. The refuse of a butcher-shop and horse manure were frequently pitched over this fence.

The abrasion produced was of trifling character, and no attention was paid to it, except that the patient wiped away the drop or two of blood which appeared upon the skin with his tongue.

On Tuesday, October 17, in the evening, he noticed during conversation a slight stiffness of the jaw muscles. The next day, Wednesday, the stiffness was more marked, and he had some difficulty in swallowing solid food.

On Thursday morning, the lockjaw was increased, and he noticed some feeling of stiffness in the muscles of the neck. He was seen at noon on this day by Dr. Petersen, who at once brought him to New York, having diagnosticated "tetanus." On Thursday evening, when first seen by Dr. Johnson, he did not appear to be seriously ill; his temperature was 99.8° F., and his respiration 24; pulse, 80. He was perspiring freely. Trismus was marked, but not absolute; his teeth could be separated about one-half of an inch. Efforts to talk caused spasm of the face and sardonic grin.

The left upper extremity was slightly stiff objectively, slight resistance being encountered on passive motion; the muscles of the neck, both flexors and extensors, were firmer than normal, as well as the muscles of the chest wall and abdomen. The patient stated that a subjective sensation of stiffness in the voluntary muscles throughout the body had been present during the day.

He also complained of feeling cold, and has since said that during his entire illness this sensation of cold was his most annoying symptom.

He does not remember having suffered from any acute pain in the contracted muscles, even during the several general convulsions through which he passed ; but his sensations during the greater part of his illness may have been forgotten, since he was more or less delirious during the time.

Upon further examination, a red, painless, insensitive, rather firm nodule, oval in shape, three-fourths of an inch in its long diameter, and apparently caused by an inflammatory exudate in the thickness of the skin, was observed upon the ulnar aspect of his left forearm rather nearer the wrist than the elbow.

The nodule was immediately excised under cocaine anæsthesia. The excision included an area of healthy skin and the underlying subcutaneous tissues. The wound was sutured. The patient also received a subcutaneous injection of Parke, Davis & Company's "Antitetanic serum," to the amount of ten cubic centimetres. The subcutaneous tissues of the chest-wall in front, of the deltoid regions, the arms, and the front of the thighs, were the regions in which this and the subsequent injections were made.

The injections were repeated every four hours, day and night ; one of the little bottlesful being used at each injection. He was also given fifteen grains of chloral hydrate and thirty grains of sodium bromide every four hours, by the mouth. He was put upon a liquid diet of the most nourishing character, including milk, beef-juice, egg-nog.

The muscular rigidity gradually increased during Friday, the following day, and on the same evening he was decidedly worse, and had a single tonic general convulsion with opisthotonos. He complained of headache, had frequent spasmodic contractions of the muscles of the jaws, thorax, and upper extremities ; perspired profusely, and was able to swallow only with difficulty.

On Saturday afternoon, October 21, he was prepared for operation, and, under chloroform anæsthesia, two small openings were made in his skull on either side of the median line, at the centre of a line drawn from the external angular prominence of the frontal bone to the middle point of the distance from the root of the nose to the external occipital protuberance.

Five cubic centimetres of the serum were then injected slowly into each cerebral hemisphere, practically the operation of Roux and Borral.

Upon the evening following the operation, the patient complained of severe headache ; the subcutaneous injections were continued ; his

temperature rose to 100.6° F., otherwise his condition remained unchanged.

There was certainly no marked diminution in the muscular rigidity for forty-eight hours following the injection into the brain. He was very drowsy most of the time, and the chloral and bromide were diminished to once in six hours.

In the evening of Monday, October 23, he was able to swallow with a little less difficulty, and that night he slept about six hours.

The rigidity on Tuesday, October 24, was slightly less; the bromide and chloral were omitted, and the antitoxin was given less often, once in every six hours.

Upon Wednesday, October 25, in the afternoon, he had a general tetanic convulsion with profuse sweating. The chloral and bromide were resumed every six hours. His temperature at this time was 100.2° F., his pulse 80.

During the night he became delirious and slept but little. Upon the evening of October 26 an erythematous rash appeared upon the neck and chest. He was still delirious. His temperature was the same, his pulse 96. The antitoxin was stopped and chloral and bromide were resumed every four hours. It was found difficult to make his bowels move.

Upon Friday, October 27, the wounds upon his head and arm were dressed and found healed. His urine was passed involuntarily. The muscular rigidity was persistent, and marked spasms of both upper and lower extremities occurred from slight causes of irritation. The injections of antitoxin were resumed every six hours. Upon the evening of this day he had a general erythematous rash upon the chest, abdomen, and extremities. The chloral and bromide were omitted, and he was given occasional small doses of morphine hypodermically when the convulsive movements prevented sleep.

During the forty-eight hours of October 28 and 29, his kidneys excreted but a few ounces of urine, which, however, appeared to contain no abnormal ingredients.

He was given large rectal enemata of salt solution, which speedily produced an abundant flow from the kidneys. October 28 and 29 he continued delirious, the muscular rigidity remained the same, and upon the 29th his temperature having risen to 102, the antitoxin was increased to once every four hours. His temperature gradually fell, and upon the 31st it reached 99.

Upon November 1 he was restless, noisy, and very delirious, and in the evening of that day his temperature had risen to 102½ and his

pulse to 108. He was given one-half an ounce of whiskey every three hours, together with two minims of the fluid extract of digitalis.

Upon November 3 the muscular contractions were markedly diminished in the upper part of the body, although his legs were quite stiff. The antitoxin was stopped.

Upon the next day his temperature fell to normal and scarcely rose again above $99\frac{1}{2}$. From this time on his convalescence may be said to have commenced. The delirium while persisting at night disappeared in the daytime, and the muscular rigidity gradually lessened.

Upon November 10 he was allowed to sit up, his mind being clear. His legs and back were still somewhat stiff, but he was able to open his mouth very well. Upon November 12 he walked about a little, was quite rational, and began to regain his strength. Upon November 16 he was allowed to walk out of doors, had a good appetite, and slept well at night.

At the present time, November 22, he states that he is still able to feel a slight sensation of stiffness, while walking, in his back and legs. His general health is excellent, except for a considerable loss of flesh. From the beginning of the treatment to the end no sudden curative effect of the antitoxin was to be observed, nor does it seem that any argument for or against the intracerebral injection of the antitetanic serum is to be drawn from this case.

No bacteriological examination was made of the excised tissues of the forearm, the diagnosis of tetanus appearing sufficiently certain.

The patient received in all forty-nine doses of the serum; each dose contained ten cubic centimetres.

Except for the erythematous rash spoken of, no ill effect appeared attributable to its use.

In a subsequent case, if improvement did not follow the intracerebral injection after twenty-four or thirty-six hours, the reporter would be inclined to inject the serum into the spinal canal by lumbar puncture. He was not sufficiently familiar with the method devised and practised by Dr. Frank Hartley, of injecting the serum into the lateral ventricle of the brain, with the idea of causing its rapid entrance into the cerebral substance by absorption through the vessels of the choroid plexus, to have formed a definite opinion; but he was informed by anatomists that there are theoretical grounds at least for the assumption that the choroid plexus is an organ which secretes rather than absorbs; if such be the case, this method may not be effective.

OSTEOPLASTIC RESECTION OF SKULL FOR TRAUMATIC EPILEPSY.

DR. FRED. KAMMERER presented a case in which an osteoplastic resection of the skull had been done for traumatic epilepsy, to illustrate the advantages of the use of Gigli's saw for separating the bone. He had found some of the instruments recommended by Dr. Buchanan in the *Medical Record*, about a year and a half ago, of great value, especially his small trephine and his dural separator. He had tried the method in two cases, and could say that he preferred it to chiseling of a groove into the bone. He generally described a pentagon with the knife, at each angle of which he bored a hole with the trephine. This is very readily accomplished with the instrument of Dr. Buchanan, which makes a very small opening; so small, in fact, that it becomes necessary to chisel away some of the cancellated substance of the inner layer of the skull in order to pass the dural separator between the dura and tabula interna from one trephine opening to the other. This is readily done by loosening the dura with Buchanan's dural separator; but he had not been well able to pass the separator from one opening to the other, so that he could then push the wire-saw along its groove as Buchanan suggests. Moreover, after the dura has been separated from the inner table, it is a simple matter to pass a silver probe with an eye bent to an appropriate curve from one trephine opening to the next, and with the aid of this the wire of Gigli's saw. In neither of the two operations has any harm been done to the dura during the various manipulations, although no special precaution was taken to prevent the same. Obalinski, Lauenstein, and Keen have also recommended the use of Gigli's saw for osteoplastic resections on the skull, but have employed different instruments than those of Buchanan. The final result in this case is certainly very good, there being perfect adaptation of the bone-flap into its old place. The time required to remove the piece of bone was from twenty-five to thirty minutes. He thought he would be able to do it in less time in the future. With the chisel it would have taken much longer, according to his experience, at least.

DR. JOHNSON asked what the greatest distance was which could be left between the trephine holes in operating on the adult skull?

DR. KAMMERER said that in the two cases where he had resorted to this method he had left from an inch and one-half to two inches between the trephine holes.

DR. GEORGE R. FOWLER said that over two years ago, August 14, 1897, the use of the Gigli saw in these operations was suggested by

Obalinski, of Krakau, in an article which appeared in the *Centralblatt für Chirurgie*. He made the trephine holes sufficiently close together to pass the saw from one to another by means of either a Deschamp needle or a properly curved canula.

DR. B. F. CURTIS said he thought this method of operating on the skull must have been developed by a number of surgeons simultaneously. The speaker said that he had already operated by the method when he saw a paper on the subject by Keen (*Philadelphia Medical Journal*, January 1, 1898) and another by Obalinski (*Centralblatt für Chirurgie*, 1897, p. 857).

Dr. Curtis said he had resorted to this procedure in eight or nine cases, and the chief criticism he had to offer upon the instruments presented was that the trephine openings were too small. In working on the child's skull, we can get along with very small openings; but in adults the opening should be at least a third of an inch in diameter in order to get the instrument through at a proper angle to pass under the skull. Dr. Curtis said he usually employed a three-eighths-inch trephine. The method certainly was a time-saving one. If the bones are thin, one can do the operation in from twenty to twenty-five minutes; with thicker skulls it takes longer. Another advantage of the method is that a bevel-shaped cut is made, and the bone-flap is supported at the edges when it is dropped back into place.

DR. WILLY MEYER said that Lauenstein, of Hamburg, suggested the use of a watch-spring with a perforated small metal knob at its tip, in order to facilitate the passage of the saw from one trephine to another, and claimed that by this method the saw could be easily drawn through. Before he hit upon this idea, a piece of fish-bone perforated at its end had been used for the same purpose.

DR. FREDERICK KAMMERER said he was fully aware that the method he had described had been followed some time before Dr. Buchanan suggested the use of his instruments. Lauenstein, Keen, and others had done the operation with the use of Gigli's saw. Personally, the speaker said he had found some of Dr. Buchanan's instruments very satisfactory. In the case he had reported, the skull was about one-quarter of an inch thick, and no difficulty was experienced in getting through it with the little trephine.

Dr. Kammerer said he thought it decidedly advantageous to make the trephine openings as small as possible. The chiselling of a small groove in the trephine opening to facilitate introduction of the dural separator is a very simple matter, and can be done in a few seconds. Then the separator can easily be introduced.

TRANSPLANTATION OF SKIN-FLAP OVER EXPOSED TENDONS.

DR. B. FARQUHAR CURTIS presented a young woman who had suffered for several years from an extensive tubercular tenosynovitis of the wrist. Two operations had been done previously by Dr. Curtis, but recurrence took place. On October 5, at St. Luke's Hospital, he dissected out all the infiltrated tissue which surrounded the common extensor tendons, and had destroyed the extensor tendons of the thumb, cutting away the skin very freely, and then covered the raw surface with a flap of skin from the patient's abdomen, left attached by a broad pedicle. Motion was begun very early, and the operation has left the woman with the free use of her fingers. The tendons were entirely exposed for two inches in the wound, being covered only by the skin-flap, but no adhesions took place, even to the skin-flap. The latter was gradually cut away from its pedicle, not being completely divided until November 3.

THE TREATMENT OF TETANUS BY INJECTIONS OF ANTITOXIN.

DR. ROBERT ABBE read a paper with the above title, for which see page 273.

In connection with this paper, Dr. Abbe presented two boys whom he had treated for tetanus during the past summer, the history of whose cases was contained in his paper.

DR. JOHN ROGERS, JR., said that his experience with the tetanus antitoxin manufactured by Messrs Parke, Davis & Company was much more satisfactory than with that furnished by the City Board of Health.

The speaker reported the following case which had come under his observation this year: The patient was a man who received a pistol-shot wound on the Fourth of July, and eighteen days later developed tetanus. The following day the muscles of the back were involved with marked opisthotonos. Dr. Rogers trephined the skull, and injected the contents of two vials of the New York Health Board's antitoxin into the lateral ventricles without producing any untoward symptoms or causing any change in the man's condition. The disease steadily progressed and death occurred four days later.

The speaker referred to two other cases of tetanus,—one a rather acute case of head tetanus, the other of the ordinary type, in both of

which subcutaneous injections of the New York Board of Health antitoxin were used without producing the slightest effect.

Dr. Rogers said he did not think the severity of the symptoms bore a constant relation to the length of time it took them to develop after the occurrence of the injury. In one of the cases which he had referred to, the symptoms did not develop until eighteen days after receipt of the injury, and on the second day the entire body had become involved. The severity of the infection can best be judged by the rapidity with which the symptoms progress after their development.

DR. G. R. FOWLER said that in a case of exceptionally rapid developing tetanus which came into his service at the Brooklyn Hospital last June, the symptoms manifested themselves on the third day, and were most pronounced in character. The convulsions were of very frequent occurrence, being excited even by the slightest movements of persons in the room with the patient, or by the turning on of the light. There was opisthotonos and the usual difficulty of swallowing. In this case, Dr. Fowler said, he injected five cubic centimetres of the tetanus antitoxin into each lateral ventricle, supplemented by the injection of ten cubic centimetres into the subcutaneous tissue of the buttocks, and later by twenty cubic centimetres of diluted serum into the arm. Death occurred six hours afterwards.

Dr. Fowler expressed the opinion that those cases of tetanus in which the symptoms develop soon after the receipt of the injury will in almost every instance end fatally, while those in which the antitoxin or the use of chloral or other remedies prove beneficial belong to the type which develop later. Experience with the antitoxin is still too limited to enable one to determine whether the remedy will bear out clinically the hopes that have been held out in its behalf. In most of the cases which have recovered after its use, other remedies, particularly chloral, have also been employed; and in some parts of the country, where the disease has been quite prevalent and of a comparatively mild type, quite a large number of recoveries have been reported under the use of chloral alone.

DR. WILLY MEYER said that during the epidemic of tetanus in this city last summer he observed a rather severe case. The patient was a boy eleven years old, who received a pistol-shot wound on July 4. Seven days later, as the first symptom, a spastic contraction of the injured arm occurred. Chloral and bromide were first employed; soon trismus appeared. The serum of the Board of Health had given out, therefore the tetanus antitoxin prepared by Roux, at the Pasteur

Institute in Paris, was resorted to. According to directions on the vials, twenty cubic centimetres were injected on the first, and half that quantity on the following day. No improvement being noticeable, the injections were repeated daily for ten days or more, fully one hundred to one hundred and twenty cubic centimetres being injected per day into the subcutaneous tissue of the thighs, abdomen, and the infraclavicular spaces, besides a large amount of a three-per-cent. carbolic solution. In this case there was never any difficulty in swallowing or breathing, but all the other muscles in the body became involved. One day Dr. Meyer was ready to do an intracranial injection, but the patient's condition again improved. The patient finally recovered.

Dr. Meyer said that in a severe case of tetanus he would be inclined to follow the method of Kocher, who, under cocaine, drilled a minute hole through the skull, and through this introduced the antitoxin. Various writers have reported cases of tetanus which were successfully treated with hypodermic injections of a three-per-cent. solution of carbolic acid, according to Dr. Borrelle's advice. Some of the patients received as much as five or six decigrams of this solution within twenty-four hours, and the injections being repeated for several successive days. As mentioned above, Dr. Meyer had made free use of these additional injections in his dose.

Dr. Meyer referred to the peculiar fact that most of the cases seen last summer were induced by toy-pistol-shot wounds, and he suggested that this may have been due to the use of impure powder. He thought the true cause of the epidemic could have been ascertained if bacteriological investigations of the different parts of the cartilages had been made by the proper authorities. With proper orders and regulations of the Board of Health, based upon such investigations, a similar epidemic could be avoided in the future.

DR. ARTHUR L. FISK said he had, fortunately, had the opportunity to watch the cases of tetanus which Dr. Abbe had reported in his paper. The use of the antitoxin in those cases effected results which offered a striking contrast to those observed after the old methods of treatment. With the exception of the second case, the injections brought speedy relief, and lengthened the intervals between the spasms. Dr. Fisk said he was convinced that the mortality in the series of cases reported by Dr. Abbe would have been much higher if the serum had not been pushed as it was. Its injection into the brain-substance did not apparently do any harm; there was no resulting paralysis.

The speaker called attention to the severe muscular spasm upon the affected side, especially in the group of muscles in the immediate neighborhood of the injured parts. In those cases where the injury was received in the palm, there was a striking contraction of the fingers, wrist, and forearm, and those were the last of the contractions in the body to yield.

DR. ROYAL WHITMAN said, with reference to the remarks of Dr. Meyer, that he had seen five cases of tetanus at the Boston City Hospital in the summer of 1882. These, and a number of others occurring in Boston and its vicinity, were caused by wounds of toy-pistols carrying an ordinary blank copper cartridge. The sale of the weapons was afterwards prohibited by the authorities.

All of the hospital patients died, and he thought that no recoveries were reported among the other cases.

DR. WILLIAM G. LE BOUTILLIER said that he had never seen a case of tetanus recover. He had seen in all sixteen or more cases, and had taken cultures from a number of others after death. During the past summer, two cases had come under his observation; in both injections of antitoxin were resorted to,—in one, intraventricular, in the other, subcutaneous,—and both ended fatally. A third case, which he had at first regarded as tetanus, came into the hospital during the first week of September of the present year. The patient was a boy who had been ill six days. The history obtained was that during the week previous to his illness he had fallen, receiving some abrasions of the hands and forehead. A few days later his mother noticed that he was unsteady in his gait, would fall occasionally, his utterance was thick, and he talked a little queerly. A few days before he was sent to the hospital he had a convulsion during the night, and his jaw seemed stiff.

The boy was admitted to the medical side of the hospital, and his case was diagnosticated as meningitis. Dr. Le Boutillier saw him by chance two days later, and thought the symptoms were so typical of tetanus that he had him transferred to the surgical ward, where he remained for three weeks. There was no loss of consciousness, no delirium, but the slightest irritation induced a general convulsion. There was trismus, opisthotonos, and difficulty of deglutition. The temperature was 101° F.; there was no eruption. Owing to the long duration of the symptoms, the serum treatment was not deemed advisable. The child during the convulsions became cyanotic and suffered severe pain. The old wounds on the hands and forehead were curetted, and an unsuccessful search was made for the tetanus

bacilli. Large doses of chloral were administered. The boy became much emaciated, although he took his nourishment in fairly satisfactory quantities. After a period of apparent improvement, a recrudescence occurred, with delirium, and the appearance of an eruption on the body. Dr. Le Boutillier said he then became convinced that the boy never had tetanus, and sent him back to the medical ward. Subsequently the spinal canal was punctured, and the fluid withdrawn showed the presence of Weichselbaum's meningococcus.

In conclusion, Dr. Le Boutillier suggested the possibility that some of the cases reported by Drs. Abbe and Johnson were cases of meningitis and not tetanus, as the delirium had appeared to be a marked feature, and this was very unusual in tetanus.

DR. A. B. JOHNSON said that if we are to accept what he believed to be a tolerably well established fact, namely, that the poison of tetanus, after entering the blood, is partly taken up by the nerve-cells, while some of it may still be circulating in the blood, we must acknowledge that there will be a goodly number of cases of tetanus which will be incurable by any method of treatment. After the tetanus poison has localized itself in any particular group of nerve-cells, the antitoxic serum does not particularly affect such cells already involved, but acts more as a protection to other cells not yet affected, at the same time, perhaps, destroying the tetanus poison circulating in the blood. The speaker said he believed there may be a considerable group of cases where all forms of treatment will prove in vain. He also firmly believed that many cases could be cured by the serum treatment; and he had not the slightest doubt that those cases reported by Dr. Abbe which had recovered under the serum treatment would have died without it.

DR. F. TILDEN BROWN asked Dr. Le Boutillier in how many of the sixteen cases of tetanus he had seen were the bacilli found?

DR. WILLIAM G. LE BOUTILLIER said the majority of those cases occurred before much was known regarding the bacteriology of this disease. In the rest of the cases, where a bacteriological examination was made by himself, he had never succeeded in growing the bacilli. In one of the fatal cases which he saw last summer the tetanus bacilli were found.

DR. ABBE, in closing the discussion, said that in one or two of his cases unsuccessful attempts had been made to find the tetanus bacilli. He had no question as to the diagnosis in any one of the nine cases contained in his report.

In connection with the remarks made by Dr. Meyer regarding

the recent epidemic of tetanus following the receipt of shot wounds, Dr. Abbe said he suspected the cause of the infection to be the cartridge-wad, which he believed was made from the pulp of waste-paper picked up in the streets. The speaker said he had sent some of these wads to the laboratory to be examined bacteriologically.

In reporting these cases of tetanus, Dr. Abbe said he did not present the subject with any rose color at all, because that would be entirely unwarranted. He did think, however, that we should continue to use the serum. He did not think the intracerebral injections should be given in every case, as many would recover without it; until the case began to assume a serious outlook, he would depend upon milder measures. He did not regard the operative procedure as hazardous, and he had seen no instance where it resulted in any mental or cerebral injury. In addition to the intracerebral injections, the speaker said he would advise subcutaneous injections and the administration of chloral and bromides; also the application of an ice-bag to the neck, with the idea of controlling the medullary excitement. The calomel purge and the free use of stimulants and nutritive enemata he also considered important. He had frequently seen the temperature fall from one to two degrees after the administration of a calomel purge, which would indicate that a certain amount of the toxins was eliminated or neutralized in this way.

Dr. Abbe said that the results of the serum treatment thus far obtained were certainly encouraging enough to warrant its continuance. No better statistics could be found than six grave cases, all promising fatal issue, out of which four were cured by cerebral injection, including the one reported to-night by Dr. Johnson, and which followed his own in the same service at the hospital. As regards the injection of the serum through a lumbar puncture, the speaker said he had announced this method during the summer, but the cerebral and subcutaneous method seemed as yet wiser. The method has been successfully employed in Germany by Schultz (*Centralblatt für Chirurgie*) in one mild case which recovered.

LIGATION OF THE FIRST PORTION OF THE SUBCLAVIAN FOR ANEURISM, WITH SPECIMEN.

DR. FRED. KAMMERER presented a specimen from a man of forty-eight years, who had contracted syphilis years before. He first noticed a swelling over the left clavicle about half a year ago. When operated on at the beginning of October, he had a well developed pulsating

aneurism of the first portion of the left subclavian artery. The tumor was about the size of a man's fist, and was partly covered by the left sternomastoid muscle and clavicle, appearing at the angle formed by them in the supraclavicular space. On October 18 the left subclavian artery was ligated one inch from the arch of the aorta, after partial resection of both clavicles, the manubrium sterni, and the sternal end of the left first rib. Even then great difficulty was experienced in passing chromic acid catgut ligatures around the vessel. Pulsa-

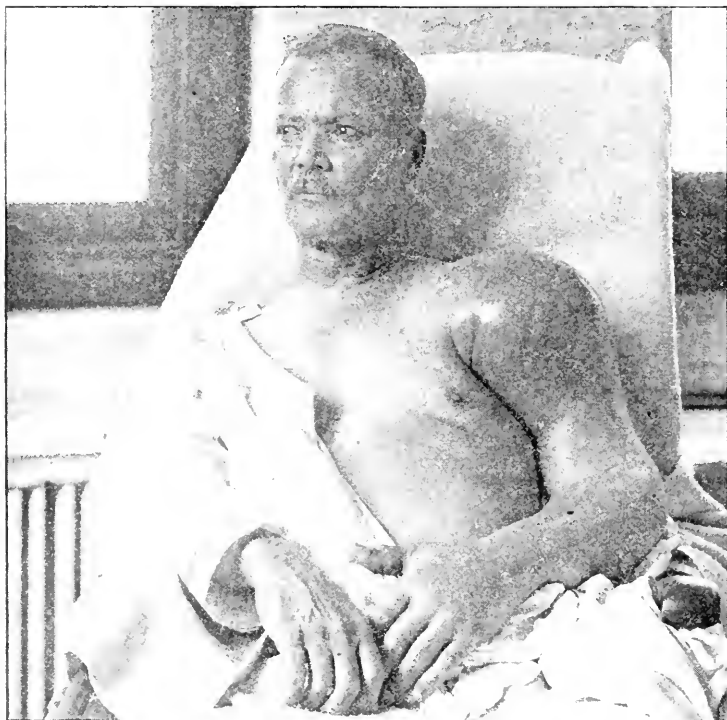


FIG. 1.—Sarcoma of the shoulder.

tion in the aneurism and left radial artery ceased immediately. Everything went well for the first three weeks, when oozing began from a point of the granulating surface corresponding to the resected end of the left clavicle, at the same time the temperature began to go up. The oozing continued for a little over a week, and the patient was beginning to show the effects of this continual loss of blood, when he succumbed to profuse hæmorrhages on the thirtieth day after operation.

At the autopsy it was seen that the ligature had not been entirely absorbed, and that the vessel had given way at the point of its application. There was no indication of a thrombus in the part lying between the ligature and the arch. In the aneurism itself a thick mass of coagulum was deposited on the entire interior surface.

SARCOMA OF THE SHOULDER.

DR. CHARLES L. GIBSON presented a specimen removed, post-mortem, from a man fifty-eight years old, a native of the West Indies



FIG. 2.—Showing change effected in four months in patient shown in Fig. 1.

and a clergyman by profession. He had always enjoyed good health until January, 1899, when a small, indurated tumor appeared on the left shoulder, which grew very rapidly. Three months after its appearance he consulted Dr. McBurney, who advised disarticulation of the upper extremity. This the patient refused to have done.

He came under Dr. Gibson's care in July, 1899, when the growth had extended to the scapula and neighboring regions. (See Fig. 1.)

The condition was plainly inoperable. He remained in the hospital until the time of his death, on November 10, 1899. During this period he suffered intense pain, which required the administration of large doses of morphine. The appearance of the tumor at this time is seen in Fig. 2, and shows the rapid extension.

The autopsy showed no metastases excepting in the pleura; these were small and apparently quite recent. The weight of the tumor was twenty-five pounds. It had started from the periosteum of the humerus, producing a solution in the continuity of the bone.

The case was interesting on account of the rapid growth of the tumor, the entire duration being only about ten months. The direct cause of death, as not infrequently the case in malignant disease, is not quite obvious. Though suffering greatly, his general nutrition was fairly well preserved. The growths did not involve any organs of functional importance, nor was there any suppuration or septic absorption.

INDEX OF SURGICAL PROGRESS.

HEAD AND NECK.

I. Situation and Diseases of the Buccal Lymph-Nodes. By DR. HANS BUCHBINDER (Strassburg). In this article attention is called to this set of lymph-nodes, which seem to have been neglected by anatomists and surgeons alike, to judge at least by the lack of mention thereof in the text-books. From anatomical research, the author depicts four groups of buccal lymph-nodes,—one set situated over the inferior maxilla at the anterior border of the masseter, another group over the buccinator just back of the angle of the mouth, a third set at the point of perforation of Steno's duct, and a fourth group over the superior maxilla.

Instigated by the first clinical accounts of Poncet and Vigier, forty cases of inflammation of these buccal glands have been recorded, 50 per cent. of which were tuberculous.

The etiology of these affections is the same as that of glandular disease elsewhere. Of main concern is the diagnosis. A circumscribed swelling at any of the aforementioned sites should always arouse suspicion.

Furthermore, the author expresses his belief that a systematic search for these glands when the submaxillary group are involved and in infections of the lip and nose will reveal their presence in greater number.

Acute infections have to be differentiated from periostitis of the jaw, the tuberculous infections from scrofuloderma and dental fistula; secondary carcinomatous involvement of these glands are also on record. A record of the author's personal experience with each of these constitutes a large part of this article.—*Beiträge zur klinische Chirurgie*, Band xxv, Heft 1.

II. Subhyoid Pharyngotomy. By DR. B. HONSELL (Tübingen). At Bruns's Clinic the classical operation (Malgaigne) was performed four times,—for the removal of artificial teeth, for a sarcoma of the pharynx, for a carcinoma of the larynx, and for a lupus of the aditus laryngis. Three patients recovered; the one death, in the case of carcinoma, being due to an acute miliary tuberculosis. The author has summarized ninety-four cases from the literature, with an analysis of the technique, the mortality, and the indications for this operation.

Preliminary tracheotomy was practised in every one of Bruns's cases, with the aforesaid result; whereas the failure to do so caused among ninety-four cases collected from literature a mortality of 66 per cent., chiefly due to aspiration pneumonia. Feeding was accomplished by stomach tube left *in situ* for one to two weeks, since Krönlein had shown that in malignant cases a postponement to feed *per os* endangers the life of the patient proportionately to the delay.

The indications for this operation have been greatly narrowed down. It is now resorted to for the removal of foreign bodies impacted in the pharynx not removable by the mouth; exceptionally for the removal of benign laryngeal growths of large size. Subhyoid pharyngotomy is in place for the removal of malignant growths of the aditus laryngis, provided the lateral and posterior parts are not invaded by the disease, in which instance thyrotomy offers the better chance. In the strictest sense, the author sees subhyoid pharyngotomy limited to malignant tumors of the epiglottis. Again, in malignant tumors of the pharynx there is a wide field for subhyoid pharyngotomy, and only modifications thereof to meet the exigencies compete with it. A new vista for this operation was inaugurated by Garré, who successfully operated a case of lupus, followed by Brondergeest, who performed this operation three times for the same condition, with two cures. As a means of affording drainage in extensive resections of the jaw, it was suggested by Trendelenburg, but unsuccessfully applied by Albert.

The mortality for this operation in all conditions is 29 per cent., and 46 per cent. of these deaths were due to pneumonia, 11 per cent.

to wound infections, and the remainder to hæmorrhage, collapse, and marasmus.—*Beiträge zur klinische Chirurgie*, Band xxv, Heft 1.

MARTIN W. WARE (New York).

GENITO-URINARY ORGANS.

I. Implantation of the Ureter into the Bladder. By DR. ACHILLE BOARI (Pescia, Italy). This operation is indicated in the cure of uretero-vaginal and uretero-uterine fistulæ, and in the treatment of fistulæ of the lower end of the ureter in general, provided the ureter is sufficiently long to permit of its implantation into the bladder. Anomalous positions of the ureteral openings may be remedied by this operation, and the incontinence of urine thereby cured. It may be employed when operating for tumors of the bladder involving the ureteral orifice. Stenosis of the lower end of the ureter, congenital or acquired, may likewise be radically cured by resection of the constricted area and implantation of the proximal portion into the bladder. And, finally, a calculus encysted in the lower end of the ureter may furnish another indication for the performance of this operation.

The same button is employed as was used to establish a communication between the ureter and the intestine.—(*Vide Annales des Maladies des Organes Génito-Urinaires*, Janvier, 1896.)

The use of the button lessens technical difficulties. The button is small, and may be removed through the urethra,—that is to say, the female urethra,—because implantation is chiefly called for in operations on the pelvic organs of women which entail a risk of wounding the ureter. If employed in the male, extraction is only possible by performing cystotomy.

The method has recently been employed four times on women, with a favorable result in every case.

The technique of implantation of the ureter into the bladder is quite similar to that employed in making a communication by the aid of the Boari button between the ureter and the intestine.

The identity of the wounded ureter having been determined, an incision through the overlying peritoneum two or three centimetres long is made, and the ureter isolated for a suitable distance. A ligature is passed round the ureter above the site of the fistula, and

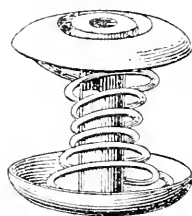


FIG. 1.—Boari's button.
(Twice the actual
size.)

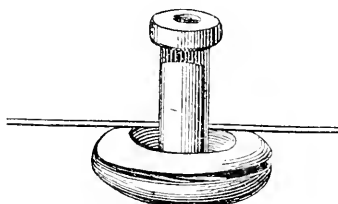


FIG. 2.—Boari's button. (Twice the
actual size; spring held down by
the stylet.)

the ureter is cut across on the proximal side of this ligature. The field of operation is suitably protected from contamination, and the possibility of approximating the ureter to the bladder is demonstrated. A button of a suitable calibre having been selected, the ureteral end is invaginated upon the tube and secured in place by a silk ligature. The movable plate is depressed till it comes in contact

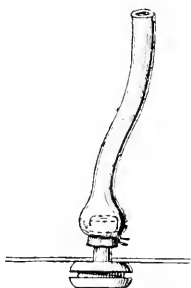


FIG. 3.—Ureter fixed upon the button.
(One-half actual size.)

with the underlying plate, and is kept in place by passing a stylet through the opening situated in the tube. (Figs. 1, 2, and 3.)

With a fine intestinal needle, a purse-string suture is inserted in the bladder at the site selected for reception of the ureter, and in the

area so mapped out an incision of suitable length is made for the introduction of the large part of the button. The purse-string suture is drawn up and tied, bringing the suture line into close con-

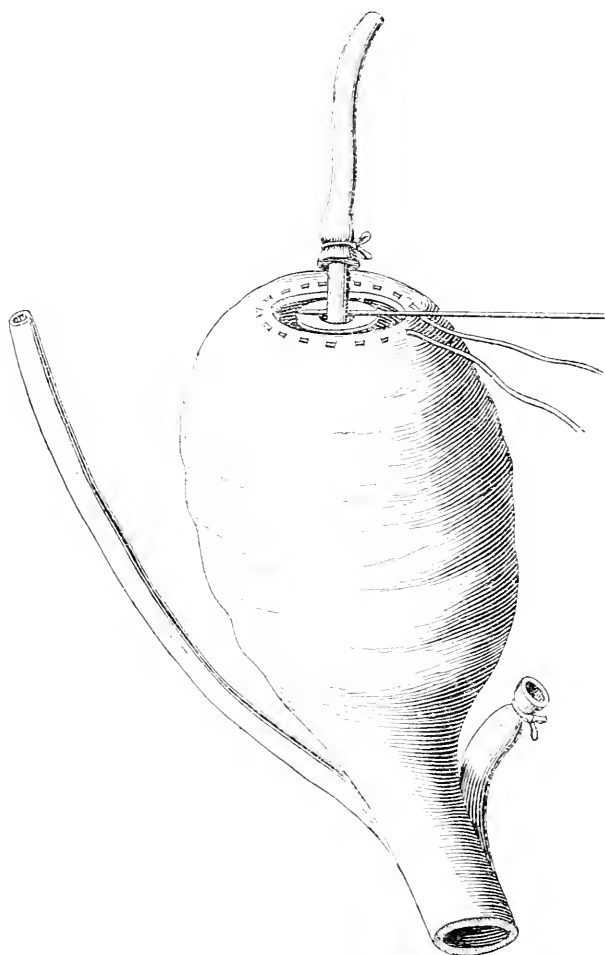


FIG. 4.—Technique of implantation of the ureter into the bladder by means of the Boari button.

tact with the tube. The stylet is withdrawn, allowing the spring of the button to bring the vesical wall into contact with the ureter. It is best to reinforce this approximation by some sutures

passed through the peri-vesical and peri-ureteral tissues. Another and better plan consists in applying the original purse-string suture only to the vesical mucous membrane, and then attaching two flaps derived from the muscular coat over the ureter, giving a broader surface of contact, and also obtaining an oblique insertion in imitation of the natural anatomical arrangement. The anastomosis can also be made extraperitoneal, after Novaro's method, by stripping off the peritoneum from the pubes to the site of the implantation and packing with gauze.

The button is easily removed after dilating the urethra, and either catching it in forceps or seizing the thread attached to the base of the button.

The use of the button has markedly reduced technical difficulties of implantation of the ureter into the bladder. Experimental investigation has been confirmed by clinical successes. Its performance is speedy and easy. There is a real disadvantage in the necessary dilatation of the urethra for extraction of the button.

Implantation of the ureter is not followed by physiological disturbances of the urinary excretion, and is devoid of the dangers of infection and cicatricial contraction attending implantation into the rectum. While no hydronephrosis due to stenosis of the orifice has been observed, in Pozzi's case there was a certain amount of renal dilatation attributable to a reflux of urine into the ureter from overdistention of the bladder. This inconvenient feature is due to want of sphincteric action, and may be overcome by making the implantation oblique, or, still better, by establishing the new orifice at the summit of the bladder.

Renal infection was found to be totally absent, and, furthermore, the observations of Bazy and Rouffart showed that a previously purulent urinary secretion may become entirely normal after this operation.

Is implantation of the ureter always possible? In other words, what is the limit of the loss of substance compatible with the performance of this operation?

The ureter is extensible, and our knowledge of its vitality and

vascular supply allows us to isolate it from its surroundings to an extent that adds several centimetres to its length. In addition, Kelly has shown that the bladder may be attracted towards the ureter by separating its attachments to the pubes. All these expedients sometimes fail of their purpose.—*Annales des Maladies des Organes Génito-Urinaires*, November, 1899.

CHARLES L. GIBSON (New York).

RECTUM AND ANUS.

I. Vagino-Rectal Operations. By DR. W. LIERMANN (Frankfort). Encouraged by the successful results of nine cases operated by Professor Rehn, the author pronounces the vaginal route as the best by which to operate extensively upon the rectum of females. Technique :—lithotomy position, tamponade of the rectum, division of the recto-vaginal septum, then extensive lateral incisions invading the ischio-rectal fossa in order to free the rectum, and at a point about one and a half inches above the anus the incisions completely surround the rectum. The bowel is never opened until the final stage unless the growth extends into the sigmoid, when it is divided, and the central segment is drawn upward in order to render visible and accessible the peritoneal folds. The sigmoid is subsequently drawn down, into the grasp of the sphincter, through the anus whose mucous membrane is freshened. To permit of this, the mesentery of the sigmoid must be sufficiently divided. The advantages claimed for this method are that there is no sacrifice of adjoining structures as in the sacral method, and the same indications that are prompting the gynæcologists to prefer vaginal laparotomy are at play here, viz.: the pathological changes have rendered the peritoneum relatively immune, the dependent situation of the wound favors drainage, and the larger size of the wound permits of quicker and more radical operating, since the uterus and vagina may be extirpated if involved. The operated cases comprised five carcinomata, one prolapse, and three non-malignant strictures.—*Beiträge zur klinische Chirurgie*, Band xxv, Heft 1. MARTIN W. WARE (New York).

BONES.

I. Acute Infectious Osteomyelitis of the Vertebrae.

By DR. OTTO HAHN (Tübingen). This is a study of forty-one cases of osteomyelitis of the vertebrae, inclusive of the author's three cases, and demonstrates the etiology to be the same as in affections of other bones. Thus the greater number of cases were encountered in the first two decades of life. The cervical vertebrae were the seat of disease seven times, the dorsal twelve times, the lumbar seventeen times, the sacrum five times. No direct cause could in any instance be cited for the osteomyelitis, which appears to be as spontaneous (?) as in the long bones. The focus of infection involved parts or the whole of one or more vertebrae. Contrary to the observation in osteomyelitis of long bones, the periosteum showed no tendency to proliferation. As might be expected, the chief complication was inflammation of the cord and its membranes, which was encountered twelve times. In twelve instances where bacterial examination was instituted the staphylococcus aureus was found.

The greatest interest centres in the diagnosis of this affection, since the local manifestations may be overshadowed by the complications of the adjoining viscera, whence the following diseases have to be differentiated: spinal meningitis, retropharyngeal abscess, Landry's paralysis, pneumonia, pleurisy, peritonitis, typhoid fever, typhoid spine.

Prognosis.—The location of this disease in the body of the vertebrae renders the prognosis somewhat grave because of the nearness of the spinal cord and other adjoining viscera. A still further estimate of the prognosis depends on what segment of the column is diseased; thus, a greater mortality follows affections of the lumbar spine, and not, as was heretofore taught, that the higher the lesion the worse the outlook.

Therapy.—Prompt operative interference incident to early recognition offers the best chances of recovery. Retropharyngeal abscesses are to be opened externally; psoas abscesses are to be approached anteriorly, as in the extraperitoneal ligation of the common iliac

artery. Even if the osteomyelitis is deemed an expression of constitutional pyæmia, operation offers the only chance of recovery, provided the physical condition of the patient permits it.—*Beiträge zur klinische Chirurgie*, Band xxv, Heft 1.

MARTIN W. WARE (New York).

II. Treatment of Fracture of the Patella by Suturing the Capsule. By DR. M. VALLAS. The author draws attention to the fact that a good functional result is sometimes found when marked separation of the bony fragments persists after patella fracture, and that a bad functional result is sometimes observed when accurate bony union has been obtained. Experimentally, it can be shown that division of the patella alone does not admit of a separation of the fragments greater than a few millimetres even when the knee is fully flexed, but that division of the capsule on either side of the divided patella at once permits the occurrence of wide separation. Fractures of the patella without injury to the capsule should be treated like hæmarthrosis—by compression, massage, and early mobilization. The difficulty of recognizing absence of capsular injury is great. Slightness of the separation of the fragments is insufficient for diagnosis. In doubtful cases the author treats as for hæmarthrosis until, after the lapse of three or four days, swelling and pain have diminished and thorough examination is possible. Palpation may show capsular rupture. If the injury involves the patella alone, the patient by the fourth day ought to be able to voluntarily lift his leg above the plane of the bed. If he cannot do this, sufficient capsular injury is present to call for operation. Any case in which two centimetres of separation are demonstrated must be operated upon.

The Operation.—Make a median vertical incision from one centimetre above the superior fragment to one centimetre below the inferior fragment. Make a transverse incision at right angles to the above and make it follow the line of fracture. This transverse incision must be long enough to expose to view the whole of the capsular rent. Carefully clean the joint cavity, removing all blood-clots, etc. Clean and freshen (if necessary) the fractured surfaces of

the patella, and pare away any shreds of periosteum which might get between the fragments when they are brought together.

The following layers of tissue are now in evidence :

- (1) Skin and subcutaneous tissue.
- (2) The deep fascia.
- (3) The anterior ligament of the knee or articular capsule consisting of the patella in the middle line, with the peripatellar fibrous tissue on either side and lined by the synovialis.
- (4) The condyles of the femur.

Suture is begun at the ends of the wound remote from the patella. The author uses metallic sutures. A suture is passed through the whole thickness of the lower lip of the wound from the skin into the joint, then from within outward through the synovialis and fibrous capsule of the upper lip of the wound. The upper end of the suture is passed in the reversed direction, *i.e.*, first from without inward through the fibrous capsule and synovialis of the upper lip of the wound, and then from within outward through all the layers of the lower lip of the wound. The free ends of the sutures are twisted over a pad of gauze. A sufficient number of these sutures are introduced to close the wound. Suture of the patella itself is unnecessary. The external wound is closed with silkworm-gut. A slightly compressing dressing is applied without drainage, and the whole covered with a plaster-of-Paris bandage. The first dressing is made after about eight days, the stitches are removed, and a splint or plaster dressing is applied. One week later splints are removed. Massage is applied to the thigh muscles, and the patient encouraged to voluntarily contract the quadriceps without lifting his leg from the plane of the bed.

About eighteen or twenty days after the operation massage of the knee is practised and passive movements are begun. Active movement of the knee and convalescence soon follow.—*Revue de Chirurgie*, October, 1899.

J. F. BINNIE (Kansas City).

REVIEWS OF BOOKS.

- I. A TREATISE ON FRACTURES AND DISLOCATIONS. By LEWIS A. STIMSON, B.A., M.D., Professor of Surgery in Cornell University Medical College, New York. 8vo, pp. 823. Philadelphia and New York: Lea Brothers & Co.
- II. FRACTURES AND DISLOCATIONS OF THE UPPER EXTREMITY. By J. E. PLATT, M.S., F.R.C.S., Late Resident Surgical Officer to the Manchester Royal Infirmary. Royal 8vo, pp. 228. London: H. K. Lewis.
- III. NOTES ON THE MODERN TREATMENT OF FRACTURES. By JOHN B. ROBERTS, A.M., M.D., Professor of Surgery in the Philadelphia Polyclinic. 8vo, pp. 162. New York: D. Appleton & Co.

I. Stimson's treatise on fractures appeared first as a distinct volume in 1883, and was followed by a second volume, on dislocations, five years later. These at once took rank as standard reference books, but are now to be superseded by this one volume, and which is practically, therefore, a second edition. The author has recast his work into a more personal form, giving less space to quotations, and citations of divergent views upon disputed points, and to historical data, and has made more prominent his own personal views and experience. This certainly greatly enhances the value of the work; but the careful reader cannot fail to see frequent traces of the difficulty he has experienced in shaking off the fetters of the method of composition originally adopted, in the frequency with which previous foreign authors are quoted, particularly Gurlt. Thus, when the comparative frequency of compound fractures in different regions of the body is to be stated, the figures of the German writer are given, and not those of the author's own hospitals of Bellevue or Hudson Street. When a classification of the displacements of which the fragments of a fractured bone are susceptible is to be made, Malgaigne is the one who

is credited with the simple and obvious natural list submitted. When the subject of fractures by muscular action is to be elucidated, "the following cases taken from Gurlt" are the words with which the illustrative cases are introduced! When the fractures due to malignant disease of bone are discussed, again we find this favorite authority depended upon, the citation beginning with the words, "of thirty-two cases collected by Gurlt," but nowhere any recent statistics nor any reference to any observation by an American surgeon. Opening the book at the 324th page, where fractures of the neck of the femur are under discussion, and the danger to life created by the accident is the special theme, he begins by saying, "Of the sixty cases collected by R. W. Smith." Now, Smith wrote in Dublin more than fifty years ago; surely a much larger and more recent experience might have been gathered from the hospitals of New York City which would have been of greater interest and value to the surgeons of the present day.

Possibly these criticisms are hypercritical, but in view of the eminent qualifications and extraordinary opportunities of the author to give to the profession a fully up-to-date treatise on fractures, they may not be wholly unwarranted. There is still a place for a systematic treatise on fractures which shall present the experience, views, and practice of English-speaking surgeons of the present day.

The book as a whole is a most excellent one; it is conservatively progressive, most of its teachings being wise and safe, while its way of putting things is concise and clear. An excellent series of X-ray full-page plates add to the number and value of its illustrations.

II. This little book is an exceedingly interesting and valuable analysis of about seven hundred consecutive cases of fractures and dislocations of the upper extremity personally observed by the author at the Manchester Royal Infirmary during a recent period of two years, while he held the position of Resident Surgical Officer at that institution. It is an excellent example of the use which an intelligent and zealous young surgical resident can make of the opportunities which an active and extensive casualty service in a great city affords. We commend it to the imitation of others—and their number is

great,—who are enjoying similar opportunities. The richness and variety of the Manchester Royal Infirmary service is shown by the numbers of different injuries which came under the observation of Mr. Platt during two years. There were 115 fractures of the clavicle, 5 of the scapula, 131 of the humerus, 142 of the radius and ulna, 179 of the radius alone, and 39 of the ulna alone. There were 77 dislocations at the shoulder-joint, 33 at the elbow-joint, 3 at the sternoclavicular joint, 7 at the acromio-clavicular joint, 6 of the head of the radius, and 3 at the wrist-joint.

The results of the treatment, as reported, seem to have been above the average, and sustain the wisdom of the methods employed. Of especial importance are the observations as to the unwisdom of early attempts at mobilization after injuries at the elbow, and the importance of primary complete reduction of displacement in fractures of the lower extremity of the radius.

III. From time to time during the past twenty years, Dr. Roberts has contributed essays upon certain phases or departments of the subject of fractures, which have always commanded attention because of their agreement with advancing knowledge and of the terseness and vigor of their style. These have now been gathered together into the volume before us. Independent thinking and common sense are two marked characteristics of the contents of this book. The author writes from the stand-point of the thoroughly trained and skilful surgeon of the aseptic period, and applies to the treatment of fractures the principles which govern the treatment of wounds of other tissues of the body. There are nineteen chapters, or essays, here presented. Of these eight chapters are devoted to fractures of the lower extremity of the radius. Fractures of the humerus are considered in two of the chapters, and to the tibia and fibula is devoted one. Simplicity, exploratory incisions, tenotomy, subcutaneous nailing, each is treated of at length, and the indications calling for such interference clearly set forth. The book makes for good surgery; it is interesting reading, and one lays it down feeling refreshed and stimulated by its perusal.

LEWIS S. PILCHER.

LECTURES UPON THE PRINCIPLES OF SURGERY. By CHARLES B. NANCY, A.M., M.D., LL.D. 8vo, pp. 398. Philadelphia: W. B. Saunders, 1899.

This work comprises thirty-six lectures and an appendix containing a *résumé* of the principal views held concerning inflammation. The lectures, for the most part, are devoted to what is ordinarily termed surgical pathology; the remainder to such subjects as hæmorrhage, treatment of wounds, sterilization, shock, various forms of delirium, and anæsthetics.

The lectures on surgical pathology are particularly admirable. The subject is treated on the most recent lines of scientific research; the facts are impressively presented, and the practical side is always well in touch with the theory. The always vexatious subject of inflammation is especially well elucidated, and the logical deductions are of the soundest nature. Equally commendable is the presentation of the subjects of immunity, natural resistance, and autointoxication. In the later chapters, devoted more to the practice of surgery, the personal views are well marked, and there is naturally some divergence from the views of other individual teachers.

The book is to be recommended to the student as a thoroughly sound work, out of which he can study the most necessary elements of the art of surgery to great advantage. There is a total absence of "padding," and, also, of confusing quotations from other writers.

CHARLES L. GIBSON.

AN AMERICAN TEXT-BOOK OF SURGERY. Edited by WILLIAM W. KEEN, M.D., LL.D., and J. WILLIAM WHITE, M.D., PH.D. Third edition, thoroughly revised. Philadelphia: W. B. Saunders, 1899.

Two former editions, to the number of nearly 29,000 copies, have not sufficed the demand for this standard text-book.

"In the present edition, among the new topics introduced are a full consideration of orrho- (serum) therapy, leucocytosis, post-opera-

tive insanity, the use of dry heat at high temperatures, Krönlein's method of locating the cerebral fissures, Hoffa and Lorenz's operations for congenital dislocation of the hip-joint, lumbar puncture, the forcible reposition of the spine in Pott's disease, the treatment of exophthalmic goitre, the surgery of typhoid fever, gastrectomy and other operations on the stomach, several new methods of operating on the intestines, the use of Kelly's rectal specula, the surgery of the ureter, Schleich's infiltration method and the use of eucaïne for local anæsthesia, Krause's method of skin-grafting, the newer methods of disinfecting the hands, the use of gloves, etc. The increasing specialization of the surgery of the eye and the ear and the growth of the *American Text-Book* in size have compelled the editors to omit these two chapters."

The changes and additions of the third edition will contribute to maintain this work in the position it has already made for itself,—the best of its class. Of course, the more that is added to certain sections the greater seem the needs of the portions not subjected to revision, and at certain places the contrast is quite evident. Still, such a condition must almost necessarily exist; it is to-day probably as easy to rewrite a work on general surgery as to revise it. If any criticism is in place, it must certainly be directed to the lack of proportion in the importance accorded to the various subjects. For example, two pages are given to the description of certain aids to intestinal anastomosis, which to-day may be described as "antiques,"—bone-plates, catgut rings, and aids derived from the vegetable kingdom; while the Murphy button, the method most commonly employed to-day throughout the world, is dismissed in considerably less than a hundred words. Again, for a new and comparatively untried method,—Laplace's forceps,—over two pages are employed.

Restriction of space will, of course, account for a number of deficiencies; occasionally there is a pretty marked one, as failure to give more than four words to the frequency with which the bladder is exposed or injured by modern methods of operating for the radical cure of hernia. Of less frequent occurrence, fortunately, is an error of judgment, as exists in describing amputation of the penis for can-

cer, without stating the fact that removal of the inguinal glands must necessarily be an integral part of a properly performed operation.

The collaborators of this work have displayed excellent judgment in many places by omitting to include in their additions to the text a number of operations recently in vogue, but not destined to be accepted as "good surgery."

CHARLES L. GIBSON.

THE MODERN TREATMENT OF WOUNDS. By JOHN E. SUMMERS, JR., M.D. Omaha: Medical Publishing Company, 1899.

This little book touches upon the salient points of the surgery of wounds. Its author has not attempted to prepare an elaborate work, but has set down his own views concerning the general principles of the treatment of wounds. On the whole these views are sound. The book has much the style of a primer, and this, together with the meagreness of details and technique, makes it to read like a popular work for lay instruction.

"It ought to be borne in mind that any injury which leaves a foreign body other than a bullet in the tissues is liable to be followed by tetanus" is hardly a fair sample of the general tone of the work; nor is this, "Punctured wounds are met with most commonly in the feet and hands, and are often followed by serious consequences." The author says: "The treatment of all contused, lacerated, and punctured wounds belongs strictly to antiseptic and not to aseptic surgery."

In punctured wounds of the brain inflicted through the optic foramen the author advises enucleation of the eye-ball, even if it is not injured. He says, "In such a case, even if the globe of the eye is not injured, the optic nerve probably is; and in any case it is better to sacrifice the eye than to invite secondary inflammatory conditions in the orbit, and may be in the brain."

Now we come to wounds of the heart: "A wound of the heart had better be left to nature. She sometimes brings about recovery." There is better advice in the following: "Operations which in them-

selves are serious should not be undertaken upon moribund patients. To perform a tracheotomy upon a patient about to die from suffocation is praiseworthy and a duty. An abdominal section done upon a patient in like condition from a grave intra-abdominal lesion, the accurate repair of which, even under rather favorable circumstances, requires much time and manipulation, is a mistake."

Here is a comment on some of the author's society experiences with his colleagues: "One may well wonder, when casually viewing the hands of some general practitioners and surgeons as we meet them in consultation or socially, would it be possible for such hands to be so washed as to be surgically clean." The author is a strong advocate of the use of rubber gloves in surgery. During the time that he has been operating with the gloves his results have been more gratifying than formerly.

JAMES P. WARBASSE.

MOUNT SINAI HOSPITAL REPORTS. Vol. I. For 1898. Edited for the Medical Board by PAUL F. MUNDÉ, M.D., LL.D. 1899. 8vo. Illustrated. Pp. 344.

To the list of those medical institutions who are resolved that hereafter their publications shall be more than a mere compilation of statistics is to be added the name of the Mount Sinai Hospital of New York City.

Medicine, surgery, and pediatrics are the three chief hospital divisions; but the lesser departments devoted to genito-urinary diseases and to the affections of the eye and ear also exist, and each is represented in the initial volume.

The general plan followed in each service is to begin with a summary of all the work done, and then, in a series of more or less elaborate articles, describe in detail some of the most important diseases encountered. Thus, in medicine, Dr. J. Rudisch reports the series of typhoid cases observed between 1883 and 1898; and this report is supplemented by two others, one upon the results of the Widal test (Alfred Meyer), and the other by the technique employed in its use

(E. Libman). These articles should logically be grouped together instead of being scattered through the book.

Five hundred cases of lobar pneumonia are also reported by Dr. Meyer, and a number of rare and interesting cases of various diseases complete the medical reports.

For the pediatric service, Barnim Scharlau reports a series of cases.

The report of the department of general surgery, by Arpad G. Gerster, is the most lengthy and elaborate in the volume, and contains much that is of general interest to the profession. It is well supplemented by the articles of William F. Fluhrer upon the male genitalia, and by that of Paul F. Mundé upon the female genitalia; the latter, with its illustrations of operative technique, being one of the best contributions made.

The eye and ear services are well represented by articles by Drs. Gruening, May, and Koller, and an unusually instructive series of observations in the department of pathology are reported by the joint work of Drs. Mandelbaum and Libman.

Mount Sinai Hospital has existed since 1856, but the vast material of the institution has never been sufficiently utilized in the interest of medical science and art. This new departure, though its practical value as a book of reference is seriously impaired by the absence of an index, is nevertheless a step in the right direction, and it is hoped will be the beginning of a series of similar publications.

HENRY P. DE FOREST.

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ANNALS OF SURGERY,

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SURGERY IN THE PRESENCE OF SUGAR IN THE URINE.¹

By ARTHUR L. FISK, M.D.,

OF NEW YORK,

SURGEON TO TRINITY AND THE BABIES' HOSPITAL; SURGEON TO THE OUT-PATIENT DEPARTMENT OF THE NEW YORK HOSPITAL.

THE great improvement in the perfection of surgical technique in the last decade has compelled a reconsideration of former surgical traditions, among which is the "*noli me tangere*" of those individuals who, suffering with surgical diseases, are so unfortunate as to have glycosuria too. The opinion is growing, that, while such individuals are not good surgical subjects, nevertheless, with extreme care in the selection of cases and scrupulous perfection in surgical asepsis, they must not be denied the benefits of surgical relief.

Godlee, in the *Medico-Chirurgical Transactions*, 1893, thinks the advance of modern surgery should make us reconsider our position with regard to the treatment of the several forms of gangrene which occur in those suffering with diabetes mellitus. The cases which are presented in this paper illustrate some of the questions which the surgeon has to meet in reaching a decision as to when it is wise to attempt the risk of relief and when not.

CASE I.—*Diabetes Mellitus; Carcinoma of the Breast; Halsted's Operation; Recovery.* T. Mc., a widow of sixty-one years, consulted me in August of 1895 for a tumor of the right breast. She was a short, thick-set, fleshy woman, with a feeble circulation and fatty heart. In the right breast there was a hard, nodular mass about four inches in diameter in the upper and inner quadrant. The skin

¹ Read before the New York Surgical Society, December 13, 1899.

over this was ulcerated for an area of two by two and one-half inches. The breast was freely movable upon the pectoral muscles beneath, and no glands could be felt in the axilla or above the clavicle.

Examination of the urine showed the existence of 2.5 per cent. of sugar, and careful inquiry disclosed that for some time there had been the usual symptoms of diabetes. Two days after she entered my service, without any preliminary antidiabetic treatment, ether was administered, and the entire breast, pectoralis major and minor, with axillary fat and glands, *en masse*, was excised. Recovery was good, and union was by first intention, excepting for a small area, where the skin could not be brought together. Two weeks from the day of operation this area was covered with Thiersch's skin-graft under primary anæsthesia. She left the hospital, cured. On March 25, 1898, nearly two and one-half years afterward she came to me because of a slight recurrence in the cicatrix, which was removed under cocaine. The wound healed well then. The urine showed the presence of sugar by Fehling's test. In November of 1898 she again came to me because of a small ulcer, one-half by three-quarters of an inch, which she attributed to a bruise, over the lower portion of the cicatrix. This was excised, under ether, and a portion of the rib beneath removed. She left the hospital with a granulating wound. At that time there was 2.2 per cent. of sugar in the urine. She was living, to my knowledge, last August, 1899, fully four years from the time of the first operation.

The questions which arose in this case were whether an operation was justifiable in a woman of her age, physique, and enfeebled circulation or not. If so, even with sugar present in the urine in so large a percentage, would it still be justifiable? The decision to operate was based upon the moral effect of the cancer upon the woman; its rapid growth; its ulcerated condition, which must eventually result in sepsis and speedy death; and also that the duration of carcinoma is short in comparison with diabetes, which may run for ten years. Certainly the case was a favorable one for operation, barring the sugar. The risk was taken, and the end justified it.

Landau says that in cases of cancer which admit of operation we have to remember that the diabetes may last for ten years or even more in old or stout people; but, on the other hand, carcinoma usually leads rapidly to death. Therefore, we

ought not to be frightened at energetic measures. There is no doubt that the danger is greater in diabetes, but where there is everything to lose one must dare much.

CASE II.—*Diabetes Mellitus; Acute Suppurative Appendicitis; Operation; Recovery.* Mr. P., a man fifty years of age, on March 7, 1895, was taken suddenly with an acute attack of appendicitis. The following day symptoms of perforation occurred, and on the second day from the onset, at 3 P.M., he was seen by Dr. Abbe. The temperature was 102° F., and pulse 100. The abdomen was distended, tympanitic, and rigid, and there was a distinct tumor in the right iliac fossa. The physician said that sugar had been present in the urine for several years. An operation was decided upon, ether given, the abscess evacuated, and appendix excised. The patient made an excellent convalescence, and the wound healed slowly by granulation. He was living last summer, and engaged actively in business.

This is an instance of an acute surgical disease coming on in a man who had had diabetes for several years. Without the diabetic complication, the man was such—very stout and fleshy—that the surgeon hesitated to operate upon, but with the diabetes the hesitation was even greater. Without operation there was, without question, but one outcome, and that a speedy one. The risk of an operation seemed less, all things considered, than not, because if he did not run into a general peritonitis, he would surely become septic, a very serious consideration. By an operation the septic focus could be removed, and place him in a much more advantageous position to recover. The outcome demonstrated the wisdom of the decision.

CASE III.—*Diabetic Gangrene of Right Foot; Amputation at Middle of Thigh; Recovery.* R. M. D., a man of seventy-five, had had for years varicose veins. In the winter of 1893 he entered St. Luke's Hospital to have them operated upon, but because of the presence of glycosuria the surgeon refused to operate. In November, 1895, the great toe of the right foot began to turn dusky, then purple, finally becoming exceedingly painful and tender. Some weeks later the inflammation extended into the foot. On January 1, 1896, he entered my service at Trinity Hospital. The temperature was 101.4° F.; pulse, 110; respiration, 27. The large toe was gangrenous, and the inflammation ran up into the sole of the foot.

Examination of the urine by Dr. E. K. Dunham discovered 7.5 per cent. of sugar. This was two days before the operation. On January 8, 1896, the leg was amputated at the middle of the thigh by short anterior and posterior flaps, which were loosely caught together. Esmarch's tourniquet was used. The femoral was patent above the site of amputation, but was atheromatous. Union was by first intention, except the drainage sinus, which persisted. The patient made an excellent recovery, and was discharged cured. The examination of the urine for some months after is of much interest, showing the gradual diminution in the quantity of sugar, with its final disappearance.

On January 6 there was 7.5 per cent.¹

January	13	"	"	2.5	"	"
January	18	"	"	1.5	"	"
January	22	"	"	1.5	"	"
January	30	"	"	0.48	"	"
February	8	"	"	0.67	"	"
February	28	"	"	1.67	"	"
March	11	"	"	0.42	"	"
March	28	"	"	0	"	"
April	15	"	"	0	"	"
May	4	"	"	0	"	"

All of these examinations were made by Dr. Dunham. It is especially interesting to notice the five per cent. decline in the quantity of sugar present in the urine within five days after the removal of the gangrenous foot, with the gradual disappearance of this as the process of healing advanced.

König (*Berliner klinische Wochenschrift*, 1890-91) calls attention to similar incidents in two cases of gangrene occurring in diabetics, in which, after failure by dietetic treatment to reduce the percentage of sugar, amputation was performed, with prompt recovery from the operation, and the subsequent disappearance of the sugar from the urine.

The subsequent history of my patient is interesting. In November, 1896, he entered the New York Hospital because of gangrene of the left foot of the great and adjoining toes, with the inflammation extending well into the sole of the foot. The urine at this time was yellow, acid, 1022, with a trace of albumin but without sugar. On

¹ This was two days before operation, which was January 8, 1896.

November 19 ether was given, Esmarch's bandage put on, and the leg amputated at the thigh by long anterior and posterior flaps. The anterior flap went as low as the middle of the patella; the posterior was one and one-half inch shorter. The femoral artery was found very calcareous.

Urine examinations: November 23, clear; 1024; albumin, slight trace; no sugar. November 28, 1028; albumin, slight trace; no sugar. On December 2, sloughing of the flaps occurred, and two days later the man died.

The entire absence of glycosuria in the subsequent history of this man, and the noticeable change in the femoral artery, indicates the very important etiological part that arteriosclerosis has in diabetic gangrene. At the time of the first operation 7.5 per cent. of sugar was present, but at the second there was none.

CASE IV.—*Diabetes Mellitus; Gangrene, Second Toe Right Foot; Amputation; Subsequent Gangrene of Left Foot, Spreading Rapidly; Death.* J. G., man of sixty. In March, 1896, in getting out of bed bruised the second toe of the right foot; then he pulled off some of the skin; later it became inflamed and was incised by his physician. This was followed by sloughing and necrosis of the last phalanx. Sugar was present in the urine to 1 per cent. When I saw the patient there was sloughing of the skin on the dorsal surface of the terminal phalanx, with protrusion of the proximal phalanx through a sloughing area on the upper surface. And there was tenderness with a slight blush running upon the dorsum of the foot. Amputation above the condyles of the femur was advised but declined. Amputation of the toe was requested, although the risks and probable outcome were fully explained, and that nothing would be gained by the procedure. This was done under protest; the resulting wound was exceedingly sluggish, showing no tendency to heal, but no extension of the process took place into the foot. Gangrene of the left foot came on suddenly, which extended so rapidly that within four days the man died in a comatose state.

In considering the question of operative measures in those having sugar in their urine, opinions differ decidedly regarding the necessity of distinguishing between those in whom this

condition is transitory (glycosuria) and those in whom it is intermittent or persistent. So exceedingly difficult is it to determine this fact, that many surgeons discard any attempt to do so. Verneuil before the Société de Chirur. of Paris in 1884 said, "I hardly admit the separation, no one having so far shown me clearly where glycosuria ends and where diabetes begins. To-day in the possession of more facts, I have decided to discard absolutely, as a surgeon, at all events, the existence of an arbitrary division, which does not present, in my opinion, any practical utility. From the surgical point of view, the presence of glucose in the urine, whatever its amount, is always a serious fact.

Godlee (*Medico-Chirurgical Transactions*, 1895) writes, "I doubt the possibility of distinguishing between these conditions, and from the surgeon's point of view of the necessity of attempting to do so." Tuffier thinks that the simple presence of glucose in the urine is sufficient to provoke grave symptoms. But Smith and Durham (*Guy's Hospital Reports*, 1892), while they admit that there is great difficulty in making a distinction between glycosuria and diabetes mellitus, and although various attempts have failed to establish this difference, nevertheless, insist upon the importance of some distinction because of the more favorable prognosis.

They insist that glycosuria, with or without polyuria and albuminuria, may and frequently does occur as the result of the surgical lesion for which the patient presents himself. Consequently, by its presence it may lead to a possible erroneous diagnosis of a past glycosuric state and therefore influence the prognosis. They make, therefore, this classification:

I. Those cases in which the lesion demanding surgical aid is the actual and direct cause of the appearance of sugar in the urine, which comprises those varieties in which the excretion of sugar is determined by the influence of micro-organisms,—*i.e.*, the septic variety, which is usually the *staphylococcus pyogenes aureus*; those in which it results from the use of such drugs as chloroform, chloral and opium, and, finally, those in which it follows upon some mechanical injury, as a blow upon the head or abdomen.

F. König (*Berliner Klinische Wochenschrift*, 1896) supports this view. He says, "The French have shown that often in connection with some infection a greater or less amount of sugar may appear in the urine, disappearing again after proper surgical treatment of the infection, so that not all cases of glycosuria with infection are diabetic. The appearance of sugar in these cases is generally of short duration, lasting either a few hours or days, but rarely persisting. The sugar in many cases appears on a rise of temperature, and it follows upon the rise and is not the cause of this."

The second division of this classification is:

II. Those cases in which the sugar in the urine precedes, and is not dependent upon the surgical lesion; the lesion and the glycosuria are independent conditions, or the lesion is dependent on some previous glycosuric condition,—*e.g.*, gangrene.

The conclusions which they deduct are that—

(1) Sugar is very common in appreciable amounts as the result of toxic and traumatic lesions.

(2) There is no evidence to prove, and no reason to suppose, that as the result of this secondary glycosuric condition either the lesions themselves or the operations for those lesions are rendered more severe.

(3) . . . The previously diabetic are liable to various complications; therefore we must not, on discovering sugar in the urine, condemn a patient as liable to these complications till a full inquiry has been made into the past history and present condition.

(4) We think, therefore, that we are justified in separating, as far as possible, those cases where the sugar is the result of the lesion for which the patient is seeking advice from those where the lesion occurs in a patient previously glycosuric.

(5) There is no reason to suppose, as many following Verneuil do, that the presence of sugar in the urine necessarily implies a more guarded prognosis.

(6) On discovering sugar in the urine, if this be found to be secondary to the lesion demanding operative treatment, and not to a previously glycosuric habit, there is no contraindica-

tion to operation; and there is no evidence to show that the results will be any worse than in non-glycosuric patients.

With regard to those individuals who have sugar intermittently or persistently in their urine,—the diabetics,—Lancereaux recognizes three clinical varieties, the lean, the fat, and the traumatic.

The greatest number of cases of diabetics which come under the care of the surgeon are of the fat variety, the first three of my cases being of this class. What is of especial interest is, that the lean and traumatic varieties appear to have but little disposition to septic infection, which is thought to be due to their rapid evolution, in consequence of which tissue changes have not had time to assume the importance which they ultimately adopt in the other variety.

Smith and Durham consider operative measures upon diabetics: first, those that are urgent, *e.g.*, strangulated hernia, injuries, acute appendicitis; and, secondly, those that are not of immediate necessity, which include all that would, under ordinary circumstances, be performed. The general rules to follow in all these cases is to perform that operation which involves the least disturbance of the parts, and entails the least shock.

In deciding this question the surgeon must take into consideration the duration of the disease, the quantity of sugar, the degree of cachexia, and the results of antidiabetic treatment.

Tuffier believes that if medical treatment does not diminish the quantity of sugar, *no* operation should be performed. König's experience is opposed to this in the cases cited; and Smith and Durham have not been lead to such a conclusion. They found that in many cases where the sugar disappeared from the urine, death resulted, but in many others, when it persisted, recovery occurred.

Durham writes that he has operated upon diabetic patients in a considerable number of cases of very various nature,—from the removal of a nasal polypus to the performance of amputation through the thigh,—and that as the result of his experience he does not consider the existence of diabetes to be

seriously deterrent to operative measures, in cases in which, on general grounds, such measures are called for. The cases as a rule did well, although healing was delayed, especially when union by granulation took place. It is their opinion that there is no evidence that diabetes *per se* will lead to suppuration, but that the inflammatory troubles are due to the conveyance of micro-organisms from without. In the gangrenous affections of the fingers and toes in diabetic people, the etiological factors are supposed to be traumatisms of very insignificant extent, arteriosclerosis and nerve-degeneration. Roser thought that the diabetes was the actual cause, but he was unable to substantiate this. Israel attributes spontaneous gangrene to (1) an imperfect access of normal blood to the affected parts, (2) perfect access of abnormal blood, and (3) imperfect access of abnormal blood. The first embraces cases of senile gangrene due to arteriosclerosis; the second, gangrene following infectious diseases, and the third, diabetic gangrene.

Out of twenty diabetics who consulted him, no less than thirteen had arteriosclerosis. Smith and Durham collected sixty-three cases, in twenty-four of which the condition of the arteries was noted, and arteriosclerosis existed in all. Lancer-eaux considers the arteriosclerosis a most important factor, and Heidenheim states that clinically there is a great resemblance between diabetic and senile gangrene, and that arteriosclerosis is frequently associated with the former. In fact, so firmly is the opinion established of the etiological importance of these arterial changes in the production of diabetic gangrene, that the same operative measures must be followed in this as in senile gangrene. Mr. Jonathan Hutchinson in 1883 called attention to the necessity, in all cases of senile gangrene, of amputating high up, and he supported his opinion by five cases. This opinion has been more firmly established by Heidenheim's series from Kuster's clinic, which was published in 1891. Kuster began with low amputations, but was obliged to re-amputate higher up, because of gangrene of the wound. In every case of gangrene of the lower extremity, in which the process had extended to the dorsum or sole of the foot, he was compelled to amputate through or above the knee. This series

comprises twenty-five cases, eleven with diabetes, fourteen with simple arteriosclerosis.

Of thirteen cases in which amputation was performed below the knee, including Chopart's and Lisfranc's operations, two healed, two died of gangrene of the flaps, and nine were re-amputated.

Of seventeen primary amputations through or above the knee, two healed by first intention, three after marginal flap gangrene, three after re-amputation, and eight died.

Of ten secondary amputations through or above the knee, three healed by first intention, six after marginal gangrene, and one after re-amputation.

G. B. Smith, in order to compare the different methods of treatment adopted in diabetic and senile gangrene, collected all of the cases which had been admitted to the Surgical Wards of Guy's Hospital since 1879, to the number of forty-eight, which he classified according to their treatment under the following heads :

- (1) Local expectant antiseptic treatment.
- (2) The removal of the dead structures with the cutting through of the tendinous and fascial structures.
- (3) Amputations close to the gangrenous area,—*i. e.*, low amputations.
- (4) High amputations :
 - (a) Those carried out below the knee.
 - (b) Those performed through or above the knee-joint.

Of twelve cases treated expectantly, one recovered, three remained in *statu quo*, two were in the process of healing, one was relieved, and five died.

The cases of this class were those in which an operation was inadvisable, because of the general condition of the patient and, also, those cases in which the gangrene was limited generally to one or two toes or a patch of skin, without any symptoms of general septic poisoning. Heidenheim limits the expectant treatment to those cases in which two or three toes only are affected.

Of eleven cases in which the operation was limited to the division of the tendons and fascia in the removal of the dead

parts, or to incision of abscesses either in the dorsum or sole of the foot, every one died.

"This disturbance, however slight, of the parts seems sufficient to open up channels through which infection of the adjoining parts takes place." Heidenheim is strong in his denunciation of this procedure.

Of nine cases in which amputation was done close to the gangrenous area, two recovered after periods of eleven weeks and twenty weeks, two were convalescing—one of these after two re-amputations, Lisfranc's, and through the thigh—and five died.

"Although cases of recovery do occur after removal just above the sphacelated portion, healing is very slow; and from the results, one seems hardly justified in exposing the patient to the real and great risks that exist of secondary infection of the wound. The vitality of the parts is so small that their resistance to invasion by micro-organisms is of the lowest degree."

Of six cases of amputation through the leg, one only recovered. Death occurred with gangrene of the flaps in the remainder. This accords with Kuster's experience.

Of eighteen cases of amputation through the thigh, ten recovered, eight died; four of the eighteen cases had diabetes mellitus, and of these, three died. It appears, therefore, from this review of opinions and my own limited observations, that the presence of glycosuria in those individuals who may have surgical diseases does not in itself constitute an absolute contraindication to any and all surgical relief. Very great judgment must be exercised in the selection of cases, in the determination of the kind and extent of the operation to be performed, and the strictest surgical asepsis must be rigidly observed throughout. Infection when it occurs is from without, and is the result of an error in the technique; it thus happens the constitutional symptoms become most serious, and out of all proportion to the local, generally ending in death. When infection does not occur the operative wounds heal kindly but slowly, especially in granulating wounds. The vascularity of the tissue must be interfered with as little

as possible, so that every operation should be planned with this object in mind. This is particularly so in gangrene of the extremities, in which the statistics of Heidenheim, Kuster, and Smith and Durham show most conclusively the necessity of high amputations in these conditions. I am of the opinion that it is better to cut down upon and ligate the artery in gangrene of the extremities rather than to attempt the bloodless amputation by means of the Esmarch band, in consequence of the possible harm to the tissues, especially the bloodvessels, whose vitality is not of the best.

ON VOLVULUS IN ASSOCIATION WITH HERNIA.

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THE occurrence in his own practice of two cases of hernia in which strangulation was dependent upon a volvulus, has led the writer to investigate a number of instances in which a volvulus has been associated with a hernial tumor.

There is no pretence that the cases which are here reproduced are more than examples of the various conditions that may occur.

The literature of hernia and of intestinal obstruction is so profuse, and so many of the cases are recorded for some peculiarity other than the volvulus, or under some nondescript title, that to collect a large number of cases of this unusual condition would be a tedious and laborious task.

Not a single specimen bearing upon the subject appears to exist in four of the chief metropolitan museums (Royal College of Surgeons, Guy's, St. Bartholomew's, and St. George's), but as it is one that does not easily lend itself to museum preparations, this is not astonishing. Its rarity is better evidenced by the fact that in the Guy's Hospital post-mortem records from 1885 to 1897, inclusive, only the two cases narrated below are to be met with. For permission to include them in the present paper the writer is indebted to one of his former teachers, to whom he is already under many delightful obligations.

The cases that have been collected may be arranged in the four following groups :

(1) Volvulus of the hernial contents,—the neck of the volvulus being either within the hernial sac or close to the hernial aperture.

- (a) Cases in which all the intestinal contents are involved.
- (b) Cases in which only a portion of the intestinal contents is affected.

(2) Volvulus in which the hernial contents are implicated, but where the neck and some of the affected coils lie within the abdomen.

(3) Volvulus produced within the abdomen by the reduction of the hernia.

(4) Volvulus occurring within the abdomen from some predisposing condition, more or less directly connected with a hernia.

GROUP I.

VOLVULUS OF THE HERNIAL CONTENTS,—THE NECK OF THE VOLVULUS BEING EITHER WITHIN THE HERNIAL SAC OR CLOSE TO THE HERNIAL APERTURE.

The inclusion of two cases of volvulus in duodenal hernia gives this group the predominance over the others in point of numbers. But, with the exception of the duodenal cases, which form quite a class in themselves, there is very little to be said of the others which may not be said of volvulus in other situations. The points of interest which attach to them in consequence of their association with hernia are soon told.

The mode of origin of the twist is open to a double explanation. Either the loop may be forced into the sac in the twisted state, or vigorous and irregular peristalsis, induced by partial obstruction, may be responsible for its formation *in situ*. Sometimes one and sometimes the other explanation is correct. But at least one case in this group (Case IV), as well as every case in the next, proves the truth of the first.

It may also be gathered from one case (Case V), and possibly also from a second case (Case III), that a volvulus may exist for some time without giving rise to obstruction or strangulation.

In the production of these two conditions *traction* is a factor of great moment. If a loop of bowel be protruded into a hernial sac during a paroxysm of coughing, when the bent position approximates the root of the mesentery to the rings, it is

easy to see that a considerable drag must be put upon the ensnared loop when the natural position is resumed.

A coil of intestine may be disposed within the abdomen in a reversed position without necessarily being in a condition of volvulus, but if it is suddenly forced from the abdomen into a dependent sac and retained there, the two ends of the coil are put upon the stretch, and into a condition of tension, which results in their approximation and in a more definite development of a twist. In addition, obstruction is favored by narrowing of the lumen of the bowel consequent upon the stretching, whilst the more cord-like form of the two ends is favorable to the production of strangulation. Case V is full of suggestion on these points. The rapid increase of the enormous hernia must have put very considerable traction upon the entering and emerging intestine. To this rapid growth absolute constipation succeeded, and this was soon followed by strangulation.

The cases in which volvulus is associated with duodenal hernia call for separate consideration. The writer's colleague, Mr. B. G. A. Moynihan, in his interesting monograph on retroperitoneal hernia, has drawn attention to the fact that volvulus has been noticed in several of the cases. If the rarity of this variety of hernia, and the infrequency with which strangulation occurs in it, be remembered, volvulus would seem to be a not uncommon complication, and one that should certainly be present to the mind of the surgeon when strangulation is met with.

The conditions obtaining in duodenal hernia are very different from those present in the external varieties. The orifice is often elongated and its boundaries less rigid.¹ The sac lacks the usual fascial coverings of external ruptures, and from its situation it is difficult to imagine that traction upon the bowel or its mesentery could ever be a matter of real importance. Unusually large amounts of small intestine may be incarcerated in these sacs, and the bowel must be considerably folded upon itself, so that small loops of intestine are, no doubt, frequently

¹ In Neumann's case (Case VII) the hernial orifice was an elongated slit of four inches. There was, also, visible peristalsis, though the abdominal walls were fairly covered with fat.

so placed that their extremities are in close apposition. Such a disposition is favorable to the production of a twist, especially if tumultuous peristaltic movements are produced by a chronic or intermittent interference with the onward progress of the intestinal contents. As bearing out these remarks, it may be noted that in Cases VI and VII only a portion of the incarcerated bowel was in a state of volvulus. Lastly, it is clear that in these cases there is good reason to believe that the twist develops within the sac as a consequence of the excited intestinal movements.

(a) CASES WHERE ALL THE INTESTINAL CONTENTS OF THE HERNIA WERE INVOLVED IN THE TWIST.

CASE I.—Mr. Charles J. Symonds. *Guy's Hospital Post-mortem Reports*, 1889, No. 335.—S. R., aged seventy-two, was admitted on August 26 for strangulated right inguinal hernia. He had been ruptured for fifty years. His hernia became painful on August 25, and next morning he vomited. Herniotomy was performed, and much omentum found in the sac, together with a volvulus of the small intestine. This was reduced, but the gut looked bad. After the operation the patient passed flatus, but no motion, and sank as though unrelieved.

Post-mortem.—No general peritonitis and no fæcal extravasation, but the gut, which had been strangulated, was adherent to adjacent coils lying just above the brim of the pelvis.

Commencing thirty-nine inches above the valve was a deeply congested, cedematous, and in parts gangrenous portion of intestine, nine and one-half inches long. This had evidently been a volvulus. The surface was covered with lymph, and there was a small perforation made in removing the gut from the coils to which it was adherent. The mucous membrane was very much congested with numerous patches of sloughing, which exposed the muscular coat. This, too, in parts seemed gangrenous, but fæcal extravasation had been prevented by adhesions to surrounding coils.

CASE II.—Dr. Cabot. *Boston Medical and Surgical Journal*, 1857-58, Vol. lvii, p. 137.—A week ago Dr. Cabot had been called to see an elderly man who had had a reducible inguinal hernia, for which he had worn a truss. About three o'clock in the morning, having got out of bed for some purpose, on returning he found the hernia down, and fell asleep without reducing it. On awaking again

he found the tumor quite large, and was unable to put it back. There was pain in the abdomen. Dr. Cabot saw him at 1.30 P.M. He was then almost pulseless, and the tumor, which was about the size of the head of a foetus at full term, was blue and cold. It was also oedematous, and there was absence of gurgling. Above the tumor was a band quite tense. Dr. Cabot operated. He slit the sac open from top to bottom, and found that the whole mass consisted of a large amount of intestine twisted entirely round upon itself, and in a state of complete strangulation. The patient died before next morning.

CASE III.—Du Chaussoy. *Archiv. générale de médecine*, 1860, Vol. i (Ve serie, tome xv). Case p. 325, Maunoury thèse, 1819, p. 30.—A woman aged seventy-four was the subject of a left crural hernia larger than a couple of fists, which had been strangulated for twelve days. The tumor was bossed, soft, and not painful, and there was no alteration in the color of the skin. Dupuytren tried taxis in vain, and then operated. After dividing and separating bands and adhesions within the sac, he was still unable to reduce the intestine. Symptoms persisted for two days, and the intestine became gangrenous and was incised. There was no relief, however, and the patient died.

Post-mortem.—There were adhesions between the convolutions which formed the hernia. A little before the bowel passed under the femoral arch it was crossed like a figure 8. The descending portion passed underneath the ascending portion. Where the twist took place an omental band passed in front, to be attached to the pelvis, and formed a cord which compressed the intestine.

This case was quoted by Du Chaussoy to illustrate the belief that a torsion may often be a consecutive phenomenon to occlusion; but the bossed tumor, suggestive of sacculation of the sac, and the bands and adhesions within it, make it more probable that the twist was of some standing, and that strangulation had resulted from contributory causes.

(b) CASES IN WHICH ONLY A PORTION OF THE INTESTINAL CONTENTS
OF THE HERNIA WAS TWISTED.

CASE IV.—Mr. J. T. J. Morrison. *Birmingham Medical Review*, December, 1897.—R. C., aged thirty-eight, was admitted to the Queen's Hospital on October 1, 1894, with a left inguino-scrotal swelling, which latterly a truss had failed to keep up. He was

acutely ill, and the tumor was as big as a child's head, irreducible, intensely painful and tender, and impulse was absent or doubtful. Four hours previously, during a paroxysm of coughing, it suddenly increased prodigiously in bulk, and became at the same time the seat of pain so acute as quickly to induce a condition bordering on collapse. There had been no vomiting. On opening the sac, five hours after the onset, some blood stained fluid escaped, and coils of intestine about one yard in length, little the worse for their incarceration. In the depths of the sac another loop of small bowel about twelve inches long was seen. It was very dark in color, but showed no loss of lustre. This loop was twisted round its mesenteric axis.

On drawing out a little more of the bowel beyond the implicated portion a firm substance could be felt within the layers of the mesentery, most likely lymphatic glands. The twist was relieved, the bowels reduced, and a radical cure completed. Satisfactory recovery took place.

Here the facts seem to point to the sudden extrusion of a second loop of bowel, very likely in a twisted condition at the moment of prolapse. Traction upon the ends of the loop and the cramped position in which it must have been placed would be likely to favor the development of strangulation.

CASE V.—Dr. J. C. DaCosta. *ANNALS OF SURGERY*, February, 1899, p. 280.—A man of forty-nine had had hernia from fifteen years of age, which recently had grown rapidly. He could wear no arrangement to keep it up. The rupture was an inguinal one and extremely large,—enormous.

For three days before admission there had been colicky pains in the mass and throughout the abdomen. There had been absolute constipation for several days. There was nausea without vomiting, and the hernia was very tender to the touch. The sac was found to contain the appendix, cæcum and most of the ascending colon, a considerable portion of the ileum and a mass of omentum. A portion of the ileum was found deeply congested and strangulated; it was twisted and firmly adherent to the surrounding structures. The great bowel lay to the outside and to the posterior portion of the sac, and it was a question whether the sac was complete at this point.

The adhesions were separated, the omentum removed, and the hernia returned with difficulty, and recovery followed.

CASE VI.—Mr. J. Jackson Clarke. *Transactions Pathological Society of London*, Vol. xlv, 1893, p. 67.—This was a case of duodenal hernia, in which Mr. Page found the whole of the small intestine. At the post-mortem “about a foot of the upper part of the ileum was deeply congested; the rest of the small intestine had a normal appearance. The congested portion had probably been twisted within the sac.” The patient had been seized with sudden pain, which caused him to fall in the street.

CASE VII.—Dr. Neumann. *Deutsche Zeitschrift für Chirurgie*, Band xlvii, page 476.—A woman, aged fifty-five, was admitted August 10, 1897. Thirteen years ago she had a “hardening” in the right inguinal region, and very obstinate constipation for three weeks.

On August 4, 1897, there were sudden cramp-like pains in the abdomen. August 5, slight vomiting. August 6, stercoraceous vomit; no stool or flatus since August 4. August 10, admitted; abdomen moderately distended and tender; visible peristalsis—*immediate operation*—a right duodenal hernia was discovered. Two coils of gut passed through the hernial aperture—an upper one, distended, at the upper angle; a lower one, collapsed, at the lower angle. The entering gut (the upper coil) could be traced to the flexura duodeno-jejunalis; it was about one and a half metres long, and was dependent to a tolerably long mesentery. The emerging gut after a course of about three-fourths of a metre ended normally at the cæcum, and had a normal mesentery. The sac containing the bowel lay to the right of the spinal column and formed a tumor larger than a child's head. The entering bowel could not be withdrawn, but the emerging bowel fairly easily followed an up-and-down movement of the finger. At the seat of stricture on the latter bowel was a well defined cord-mark (constriction), embracing three-fourths of the circumference, and then followed a tract about one metre long, extremely cyanotic and moderately distended. Further attempts to draw the bowel out were futile, but with several fingers introduced into the hernial aperture, a tolerably large loop of bowel was found twisted into a pedicle at the upper end of the ring. The volvulus was untwisted with difficulty in the sac, and then a loop of bowel one-half a metre long came easily. It was of a deep blackish-blue color, its surface was dull at places and the mesentery slightly cedematous, and here and there showing infarcts. The patient recovered.

GROUP II.

VOLVULUS IN WHICH THE HERNIAL CONTENTS ARE IMPLICATED,
BUT WHERE THE NECK AND SOME OF THE AFFECTED
COILS LIE WITHIN THE ABDOMEN.

This group is of great interest and importance. The conditions are complicated, and the hernia is essential to their production. The cases usually run a very urgent and rapid course, and the length of bowel involved is very considerable, averaging, as a rule, quite a couple of yards. The surgeon's attention is first directed to the rupture, but the key to the solution of the case lies within the abdomen, and can rarely be reached without an extended incision through the abdominal wall.

The mechanism of the obstruction is as follows: In the first instance a twist of the bowel takes place within the abdomen, and then a portion of the twisted loop enters the hernial sac and becomes engaged in it. This prevents the twist from righting itself. Also, it will be seen directly that in consequence of anatomical facts, the neck of the involved loop is necessarily tethered to a certain spot. As the hernia grows, more and more of the coils of the volvulus escape from the abdomen into it, until it ends in one limb of the twist being pulled upon and becoming taut. This stretched segment lies entirely within the abdomen. One end of it joins a portion of the bowel that is stationary; the other is fixed in the hernial orifice. The central end is usually connected with the cæcum, but the exact part may vary as a consequence of congenital abnormality (Case XII). The termination of the duodenum may possibly serve the same purpose of anchoring the volvulus at its neck (Case VIII?).

The peripheral end is fixed at the neck of the sac, either by adhesions (Case X) or in consequence of the irreducibility of the hernial contents, a condition which frequently depends upon the large amount of fat mesentery that has become imprisoned in these cases.

For all practical purposes this stretched intra-abdominal portion of one limb of the volvulus is converted into a stout band, and under it the other limb of the twist and a varying

portion of the mesentery are compressed and often strangled. In Case VIII, however, the disposition of parts would appear to have been such that strangulation resulted from one limb hanging over the other, which was fixed more like a slack wire than a tight band.

It will be readily recognized that the condition here described is of a remarkable and unusual character, and presents mixed features,—viz., *those of strangulation by volvulus and those of strangulation either over or beneath a band.*

This mixed form of strangulation explains the unequal degrees of engorgement sometimes exhibited by different ends of the volvulus. Something of this was observed in Case VIII, but in Case IX marked signs of strangulation were present in the coils which were traced to the point where the bowel was compressed, whilst the coils at the other end of the twist, which passed into that portion that acted like a band, were hardly congested.

One other sign of importance was noticed in two cases. The abdomen was tender on pressure. This tenderness in Case IX was very marked and distinctly localized, and corresponded to the position of the neck of the twist; and as the hernia could be handled freely without pain, it raised a very strong suspicion that the cause of the trouble lay within the abdomen. It is probable that this symptom is present in most cases, for the localized peritoneal inflammation at the seat of strangulation, which is responsible for it, can rarely be absent.

Treatment.—From the manner of the strangulation in these cases it might be thought that with the reduction of the hernial contents the obstructing band would disappear, the strangulation would be relieved, the twist might become less pronounced and capable of righting itself, and recovery might ensue. But such hope is vain. The lengthy coils of swollen, œdematous, and ecchymosed bowel remain inert and immobile, and the constricting portion of the gut, though its tautness is relaxed, remains *in situ*, very much as it was, unable to alter its position because of the pressure of the stationary and distended intestines overlying it. Reduction of the hernia alone, then, cannot be of use when strangulation has set in.

Moreover, it will, in all probability, be generally admitted that the outlook in those cases where many feet of small bowel are strangled in a volvulus, is practically hopeless with the present methods of treatment. Of those cases that the writer has seen in the practice of others, all have proved fatal, and when he saw the amount of bowel affected in Cases VIII and IX, he never for one moment believed that recovery was possible.

But attention is forcibly attracted to the fact that the only successful case in this group was one in which the damage to the bowel was greater than in any of the others, and the amount of bowel affected not less. The heroic course pursued was necessary, because the gut was gangrenous, but its complete removal resulted in a most gratifying success. Why then do these cases die? In cases VIII and IX both survived too long for the idea of shock to be entertained, and there can be little doubt that they succumbed to intestinal toxæmia, the importance of which, as a cause of death in intestinal obstruction, had been gradually forcing itself upon the attention of surgeons until it gained both point and clearness from the publication of the views and experience of Professor Kocher, of Bern.—*British Medical Journal*, October 29, 1898, p. 1299.

In the *couple of yards or so* of blood-sodden, infiltrated, and inflamed intestine, which seems to have been present in most of these cases, there existed every opportunity for the invasion of intestinal micro-organisms and the production of their toxins in overwhelming quantities; whilst as soon as the obstruction to the return circulation was removed, the rapidity of the latter's absorption would be greatly accelerated.

Professor Kocher advocated the draining and washing away of the fetid contents of the bowel above the obstruction. But irrigation will not get rid of the micro-organisms which have already found their way into the intestinal tissues, or the toxins that have accumulated there. They must be dealt with by the protective powers of the patient, and the larger the tract of tissue invaded the more sorely will those powers be tried.

Now the method adopted by Dr. Dreesmann in Case XI was

thorough. He made away with both the micro-organisms and their accumulated toxins, as well as with the unhealthy intestine, which was at the mercy of the first and served as a storehouse for the second. All the patient had to do was to surmount the shock and repair the wound,—not to struggle to eliminate a continually forming poison and to destroy its producers.

The importance of this case when compared with the others can hardly be over-estimated. The writer feels that to advocate the removal of large lengths of small intestine which are not in a state of gangrene is a step to which few surgeons will, at first, be likely to agree. But the lessons to be gathered from the cases in this group would seem to point to it in no uncertain manner. He is convinced that had enterectomy been performed in Case VIII the patient would have had at least a reasonable prospect of recovery, but in Case IX everything would have depended upon the power of the patient to stand the operation.

At the same time it is not to be forgotten that the excision of six or seven feet of small bowel may not be so severe a measure in these cases as it sounds. In Case VIII the neck of the mesentery to be divided was very narrow and thin, perhaps two or three inches only; whilst in Case IX it measured five inches. The operation, apart from other conditions, would probably entail no more shock than would the removal of a few inches of bowel.

The danger, of course, would be that the depressed and poisoned condition of the patient might make it impossible for him to survive an operation of such gravity.

CASE VIII.—The writer's first case.—S. I., a stout woman, aged sixty-two years, was admitted into the Leeds General Infirmary at midnight, on May 16, 1897, with a very large strangulated umbilical hernia. The same evening at seven o'clock, when engaged in her usual occupation of nursing, she had been seized with pain in the tumor. At 10 P.M. it became very severe, and she had vomited several times. The bowels were opened, but very little flatus passed. When admitted she was evidently in intense pain; very restless, complaining of thirst, and urgent for relief at any cost. The tongue was

moist, the pulse slow (54) and of good volume, and the extremities were neither warm nor yet very cold. There was much retching and the vomit contained currants. The tumor was as large as a Rugby foot-ball and partly buried in the fat parietes. The projecting portion had a transverse diameter of twelve and a vertical one of eight inches. It had a bossed surface pointing to secondary sacs, was resonant all over, and *remarkably* tense.

At 1.30 A.M. on the seventeenth the patient was put under ether and the tumor laid open from top to bottom. Many ounces of dark, blood-stained fluid escaped. Several feet of small intestine occupied the main sac and several good-sized loculi. The bowel was distended, and was black with blood, which was effused into its coats and on to its serous surface, where it lay in clots, and also into the mesentery belonging to it. The intensity of the condition varied, the coils on the left side being only of a deep purple color. The mesentery lying in the sac was very thick and fat and constituted the obstacle to the reduction of the gut. The ring was a thick-margined, vertical aperture (one and one-half by three-fourths of an inch), and was not the seat of stricture. The intestine at this point was investigated. Healthy bowel, separated by a mark of constriction from the congested loop, was reached after a few inches of the lower segment had been drawn out from the lower angle of the opening, but at the other end of the loop inch after inch of black distended gut was drawn from the upper angle of the hernial opening, until more than a foot had been pulled outside, when it passed abruptly and without any definite mark of constriction into healthy bowel. The whole of the affected intestine was now in view and was seen to constitute a volvulus. A single half turn released it, and the bowel was returned to the abdomen after the ring had been considerably enlarged. The operation was then quickly concluded. Quite four, and possibly six, feet of small intestine must have been implicated in the twist.

Subsequently there was a good deal of abdominal pain, some vomiting, and very little sleep, but the intense agony was relieved and several feculent motions and much sanious fluid were passed in the bed during the forty hours which elapsed before death took place.

The post-mortem report is not forthcoming.

In the absence of post-mortem information the following explanation is suggested with reserve. The irreducible state of the hernia and the presence of several large loculi occupied by bowel sufficiently prove that in this instance the volvulus was

not the result of a recent twist. When the bowel entered the sac for the last time it did so in a reversed position.

As more and more of the reversed loop became engulfed in the rupture, the ends would become approximated and cross, and so be brought into a condition of volvulus. The traction exerted by the dependent tumor is a matter of great importance in this instance, and the atrophy of the mesentery lying in the neighborhood of the ring, which usually takes place in old-

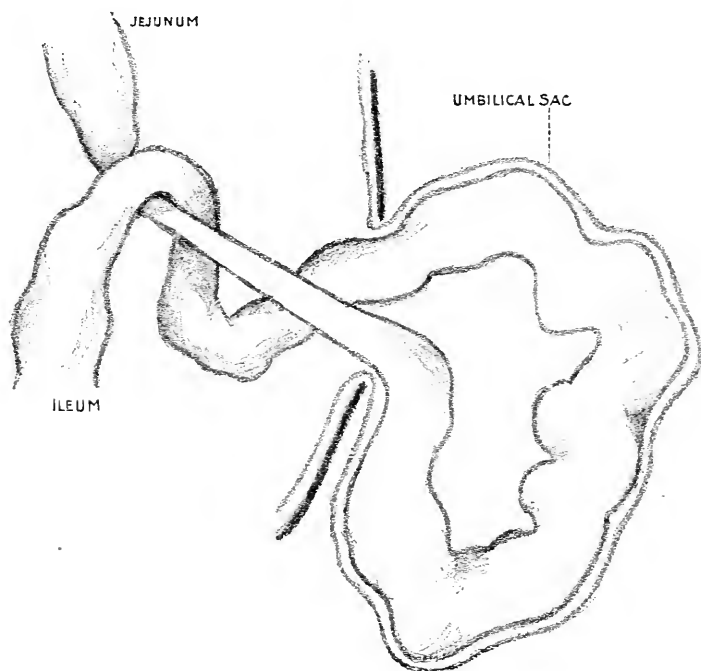


FIG. 1.—Diagrammatic sketch of the probable arrangement of parts in Case VIII.

standing irreducible ruptures, would lead to that narrowing of the mesentery and approximation of the two ends of the loop which are such important features in the development of volvulus, and which at the operation were seen to be present in this case.

In the accompanying sketch an attempt is made to illustrate the probable arrangement of parts within the abdomen.

It will be seen that the upper limb of the twist acts as a slack wire or band, being certainly fixed at the ring in consequence of the irreducible nature of the hernia, and probably fixed at its other extremity in some way or other which is not difficult to imagine.

The intra-abdominal portion of the lower limb—much the longer of the two—hangs over this band, and a trivial circumstance, such as an attack of flatulence due to an indigestible meal, would, by the tightening-up effect it would have upon the limbs and the neck of the twist be sufficient to precipitate the onset of strangulation.

From this diagram it is easy to understand the unequal lengths of strangled bowel belonging to the two ends of the loop that were drawn from the abdomen, and also the presence of a marked constriction on one and its absence on the other.

CASE IX.—The writer's second case.—W. M. W., aged fifty-six, a laborer and a chronic asthmatic, was admitted into the Leeds General Infirmary on October 4, 1898. For some years he had had an irreducible inguinal hernia on the left side, and had never worn a truss. At 4 A.M. on October 4 he was seized with severe pain in the umbilical region after a cup of tea. Vomiting quickly followed, and was present till the operation. The hernia became slightly larger than usual after the onset of pain. The bowels were moved twice on October 3, and no flatus was passed after the pain began on the 4th; but seven or eight hours later a quantity of bloody fluid containing clots escaped per anum. The rupture formed a swelling in the left groin as big as a medium-sized vegetable marrow. A portion of it filled the scrotum, but the bulk occupied a large diverticulum extending outward to the anterior superior spine. It was quite flaccid, and had an impulse on coughing. The contents could be easily moved about, and portions of intestine felt firm and ropy, and once were seen to be in active peristalsis. The patient *referred his pain to a point above the pubes, a little to the inner and upper side of the hernia, and the abdomen in this region was very tender to the touch.* There was no distention and no localized dulness. The pulse was 84. The patient was suffering so acutely that he immediately consented to operation and asked for no delay.

Operation.—At 5 P.M., the patient being under ether, the sac was freely opened and a small quantity of darkly-stained fluid escaped. A

coil of small intestine, about three feet in length, was found in the sac. About eight or twelve inches of it occupied the scrotum, and were slightly gripped, but not strangled, by the narrow portion of the sac just below the diverticulum. The condition of the coil varied. That part lying to the inner side only differed from healthy and rather distended bowel in being of a somewhat leaden hue, and in having a number of white spots upon it, not unlike in size and appearance those seen on some cigars. That lying to the outer side, in other words the bowel lying in the outer part of the diverticulum, was normally distended, except for a few inches, which were in firm contraction, a condition that had given rise to the ropy feeling previously described. This outer portion of the coil and its mesentery were congested and of a pinkish color, and covered with a bloody fluid. The ring easily admitted the index finger, and inside the abdomen something feeling like a thick band, stretched tight and running towards the ring, was made out.

The condition of the outer portion of the herniated coil suggested volvulus, and that end of it which passed through the ring was pulled upon and bowel drawn from the abdomen. It was exactly in the same congested and blood-smeared condition. When about twelve inches had been drawn out, a very marked broad line of constriction was reached, and then came pale and natural bowel, a trifle fuller than the affected coil, but not unduly distended. The diagnosis of volvulus was now certain. A consideration of the previous case had led the writer to the conclusion that in similar cases the obstruction would disappear with the reduction of the bowel into the abdomen. The patient's state called urgently for the completion of the operation. No serious attempt, therefore, was made to bring the twist into view, as it was clear that the proceeding would have necessitated an extension of the operation that would have immediately endangered the patient's life, but the intestine was replaced as speedily as possible. On account of the thickness and amount of mesentery that lay in the sac, the ring had to be enlarged by an incision one and one-half inches upward through the parietes before this could be accomplished. Fluid like that found in the sac escaped from the abdomen. The operation was concluded by the removal of a retained testicle and of the sac, and by the closure of the gap in the abdominal wall.

The intense pain and the vomiting were completely relieved by the operation. No flatus, however, escaped, though as a result of enemata some brown fluid faecal material, bloodstained and contain-

ing mucus, was passed on two occasions. Three hours before death very rapid distension (commencing dissolution) set in, and death occurred twenty-seven hours after the operation.

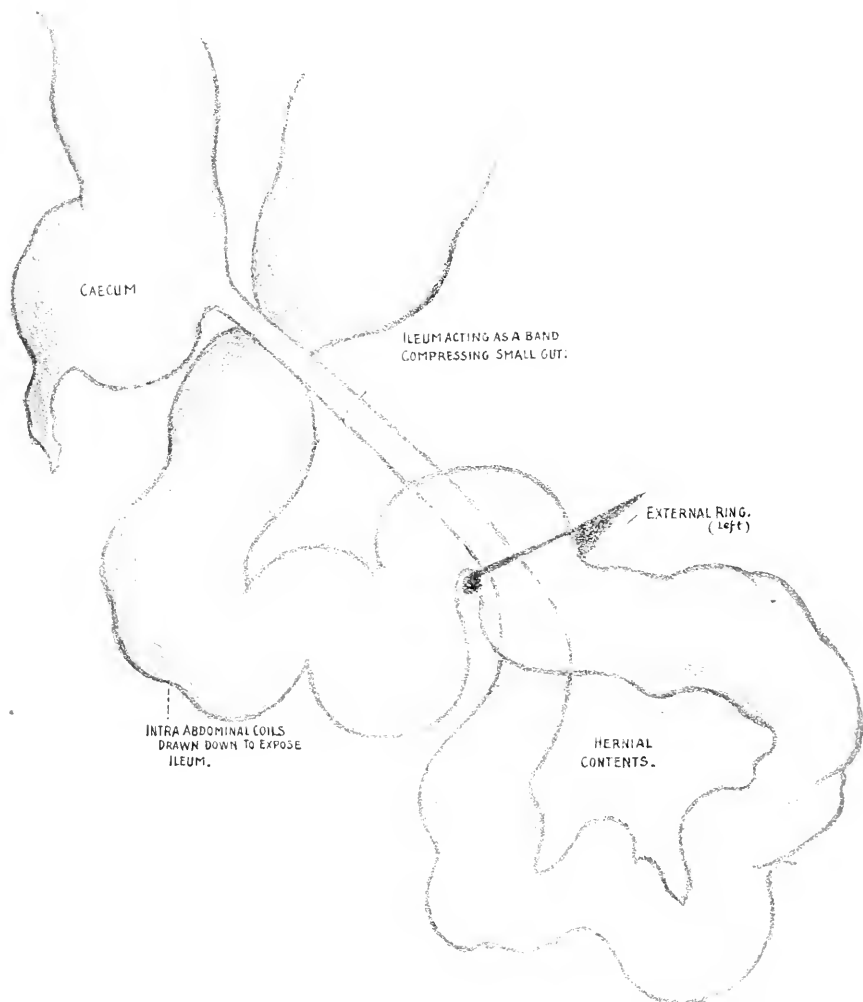


FIG. 2.—Diagrammatic sketch of the conditions present in Case IX. It may also be consulted in connection with the description of the conditions found in Case XI.

The condition found at the necropsy was as follows: The lowest four feet or so of the ileum had undergone a single half-twist from

right to left, so that at the neck of the volvulus the termination of the ileum lay over and directly across the ileum at a point some feet above the valve. The final few inches of the ileum with its mesentery were drawn out into a pale, empty, and narrowed band, and the higher portion of the ileum as it passed underneath it had been markedly compressed by it. The relative position of parts at the neck of the twist had not been materially altered by the operation. The upper portion of the twisted loop had suffered most, its ecchymosed condition and emptiness being very marked for eighteen inches

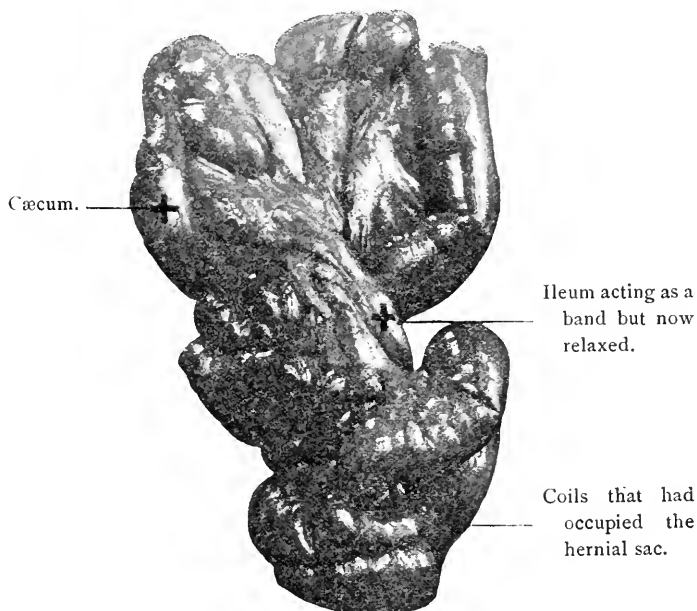


FIG. 3.—Photograph of the volvulus in Case IX.

after passing below the end of the ileum. The lower portion of the loop was congested but not ecchymosed, and contained a fair amount of gas. The last few inches of the loop,—viz., the termination of the ileum,—have been described.

The greater portion of the loop had constituted the hernial contents. The hernia was irreducible, and the twist must have formed before the bowel entered the sac for the last time. As more and more intestine came down, the time arrived when the lower limb of the volvulus began to pull upon the fixed ascending colon, and it was this taut lower segment that was felt by the finger running down to the

ring before the bowel was returned. At last the tension of this band became such that a very small matter led to the development of obstruction and of strangulation. It has been explained that the obstacle to the reduction of the hernia was the large amount of fat mesentery present within the sac; consequently, when once the termination of the ileum began to be put upon the stretch its relaxation became an impossibility, whilst further protrusion would increase the tension. The escape of blood per anum showed that the lower end of the volvulus permitted escape of its contents, both before and after the operation, the tension on the lower segment being insufficient to occlude its lumen. The reduction of the hernia, though leaving the volvulus in situ, released one end of the constricting band, and so led to the relief of the more urgent symptoms.

The cause of death was probably a combination of shock and fæcal intoxication.

CASE X.—Du Chaussoy. “*Memoire sur les relations des hernies avec les étranglements internes.*” *Archiv. générale de médecine* (Paris) 1860, Vol. i (Ve serie, tome xv), case p. 324.—A woman of forty-nine had suffered from a strangulated crural hernia for six days. It was as big as a walnut, painful on pressure, and the skin over it was inflamed. The strangulation had come on suddenly. M. Laugier operated and found gangrenous bowel which was freely opened, but satisfactory relief did not follow, and death took place eight days after the operation.

Post-mortem.—There was general peritonitis, and an interesting disposition of the two ends of the bowel which were adherent to the parietes in the neighborhood of the wound. The upper segment descending on the right side reached the iliac fossa. Here it turned and passed beneath the lower segment, which ascended from the wound toward the umbilicus, and then made a bend underneath the upper segment which overlaid the cæcum. The upper segment, distended in the right flank, became collapsed and flattened as it passed underneath the inferior segment, and on the further side of it, it dilated again and formed an angle to come and open at the wound.

The mechanism of the obstruction in this case is practically identical with that in the preceding. The difference lies, first, in the twist which in this instance was a complete one from left to right, and in Case IX only a half-twist, and from right to left, and, secondly, in the small size of the involved loop.

The gangrene of the herniated portion was clearly due to causes peculiar to hernia, but the obstacle to the progress of the intestinal contents produced by the twist no doubt determined it.

The continuation of the *obstruction* here was due to the lower limb of the twist acting the part of a band, its two ends being fixed, one at the cæcum and the other at the artificial

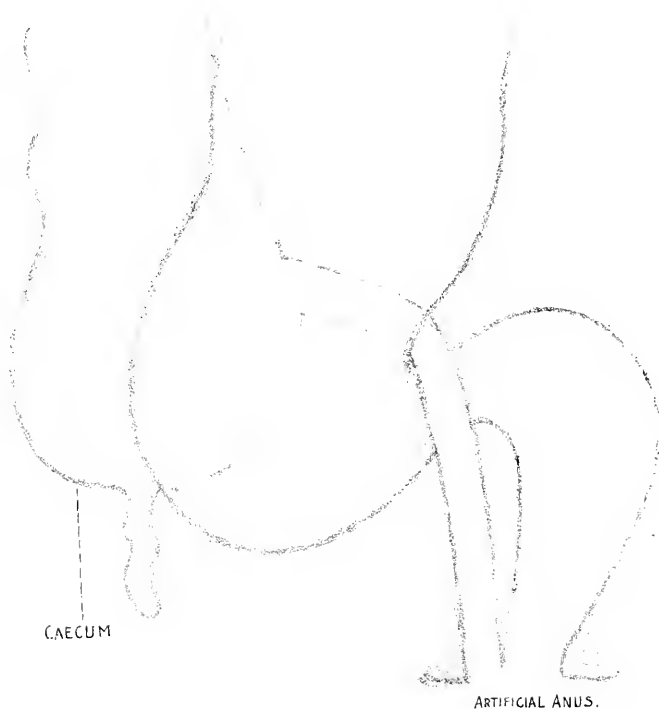


FIG. 4.—Diagrammatic sketch of the conditions described in Case X.

anus. It is impossible to say how far the conditions might have approximated to those met with in *strangulation* by volvulus, if the artificial anus had not been formed and distention of the loop had not been prevented.

CASE XI.—Dr. Dreesmann. *Berliner klinische Wochenschrift*, No. 16, April 17, 1899.—A woman, aged thirty-seven, for ten years had had a swelling in the right groin which went back after rest in bed.

It gradually increased, but she never wore a truss. On May 6, 1898, it could not be replaced, and the same night pain and vomiting set in. She was admitted to hospital next day. The hernia was the size of two fists, and tender. Pulse 160. Under anæsthesia the rupture was only slightly reduced by taxis. Herniotomy was performed. On laying the sac open offensive dark-colored fluid escaped. The loops of gut were dark black with dull surface. The gangrene extended from the central end of the bowel up into the abdominal cavity, and the whole of the gangrenous portion could not be drawn through the ring. A vertical incision was made through the abdominal wall dividing Poupart's ligament. More dark offensive fluid then came out. It was now found that the whole convolution of gut in the hernial sac was twisted to the left 180° , and was fixed in this position by a band of omentum, which crossed over the internal abdominal ring and was adherent to the parietal peritoneum, both within and without the sac. When this band was divided the gut could be untwisted. The gangrene extended for thirty centimetres further centrally; peripherally it reached to near the colon. The whole gangrenous portion was resected, and the proximal end inserted laterally into the colon. The lower opening was closed and the operation completed. Severe collapse followed the operation, but eventually the patient recovered. The length of small bowel resected was 2.15 metres.

If this description is carefully considered, it will be seen that the mechanism of the twist has a very close resemblance to Case IX (Fig. 2). In both the twist was 180° , and to the left, which would result in the lower portion of the ileum lying over the small bowel at a higher level. The omental band would appear to have acted a purely passive part, imprisoning the bowel as its distention became marked. It is to be noted that the gangrene extended to near the colon, and the portion of ileum left was no doubt too short to permit of end-to-end anastomosis.

It may, therefore, be surmised that the overlying portion of the ileum in the twist was fixed at its junction with the colon on one side, and at the hernial orifice on the other; and that, as in Case IX, this lower limb of the volvulus was acting like a band.

CASE XII.—S. Catellani, of Padua. ANNALS OF SURGERY, 1898, Vol. ii, p. 709.—L. C., aged forty-nine years, was the subject of a left femoral hernia of twenty-four years' duration, and the size of an adult's head. The day before admission she had some diarrhoea, and noticed pain in the rupture and in the abdomen, and the former increased so rapidly in size as to double itself. Vomiting occurred in the night. When admitted the tumor reached to the knees, was distended, soft, and elastic, the skin was thin and stretched, and pressure on the swelling and *on the abdomen* was painful. The patient appeared to be suffering keenly and her condition was evidently very serious. Strangulation was diagnosed and operation performed without narcosis.

The intestinal bulk was formed by about *a metre of small intestine, the transverse and ascending colon with the cæcum and vermiform appendix*. The colon was of a blackish color and the sac full of a greenish-yellow liquid having a strong smell of sulphuretted hydrogen. The surface of the protruding bowels was covered with pseudo-membranes. The abdominal wall had to be incised upwards for five centimetres before the bowels could be replaced. Death in eight hours. At the autopsy the following interesting points were observed: circumvolution of the small and large intestines, which were distended by gas and bloody liquids. The cæcum was attached by a mesentery forty centimetres long; the mesentery of the small intestine was also long (sixty centimetres) and very thick, on account of fatty infiltration.

The intestinal region which presented symptoms of strangulation comprised *one and one-half metres of small intestine and eighty centimetres of cæcum and colon*. There was no liquid in the peritoneal cavity.

This case was published as a contribution to the study of cæcal hernia. Lack of detail makes it impossible to be quite certain as to the exact conditions of the volvulus. From a careful reading of the report, however, it is clear that the neck of the twist was situated well within the abdomen, and that, as in the foregoing cases, the herniated bowel was a portion of a loop already in a state of volvulus. The enormous size and dependent condition of the rupture point to a considerable amount of traction upon one or both limbs of the volvulus whilst the irreducible state of the hernia, from a cause similar to that existing in Cases VIII and IX, and the variation in the

condition of different parts of the loop, which may be gathered from the wording of the report, seem to establish a very close family likeness.

GROUP III.

VOLVULUS PRODUCED WITHIN THE ABDOMEN BY THE REDUCTION OF THE HERNIAL CONTENTS.

The cases composing this group are too few to justify any deduction with regard to type. Case XIII proves that it is possible for the contents of a hernia to be reduced in a twisted state, and for strangulation to follow.

But Case XIV is of greater interest. There is nothing improbable about it. It might also be anticipated that a freely movable cæcum, if forcibly ejected from a right inguinal sac when distended and almost strangled, would naturally assume a position in which it would be bent at an acute angle to the fixed ascending colon. In its distended state it would be too big to fall into its ordinary place, and the absence of a meso-cæcum would allow it to be easily deflected.

Such a condition, when the bend is sufficiently acute to lead to obstruction, constitutes one of the varieties of volvulus of the cæcum, and as it would inevitably entail a continuance of the symptoms the natural inference would be that a reduction *en masse* had occurred.

CASE XIII.—Mr. Charles J. Symonds. Guy's Hospital post-mortem reports. No. 100. March 9, 1893.—A female child, sixteen hours old, was admitted with a congenital umbilical hernia containing most of the small intestine. The sac was opened and removed, the intestine returned, and the aperture sutured. The child became cyanosed and convulsed, and died in the evening.

Post-mortem.—The viscera were normal as regards development. The intestines formed a mass in the upper part of the abdomen and there were masses of clotted blood over them. The greater portion of the ileum was almost empty, and there was a sharp line of demarcation beyond which it became distended. The mesentery was torn here in the distended part and probably was the source of the hæmorrhage. The mesentery of the empty portion was thickened

and contained abundant extravasation of blood. There were also patches of extravasation of blood into the bowel. The fact that the extravasation of blood was limited to the portion of the bowel which was empty showed that some strangulation was the common cause of both. There did not seem to have been any extravasation of blood before the operation, and it appeared that on returning the bowel after the operation it had been rotated as a whole and formed a volvulus.

Of this case Mr. Symonds writes, "that it is very doubtful if the torsion had anything at all to do with the result, as the child was a very feeble creature." Perhaps this very want of vigor was the reason that the twisted bowel did not right itself.

CASE XIV.—M. Richet. *Bulletin de la Société de Chirurgie de Paris*. 1860. Second series. Vol. i, p. 75.—A man of sixty had had a right inguinal hernia for twenty years. It was reducible till lately, but for a week preceding his illness he wore no truss, and the hernia was down. At last some colicky pains made him try to return it, but he was unable. A doctor reduced it with difficulty next day, but as the symptoms persisted he was transferred to the St. Louis Hospital, under M. Richet. An exploratory incision was made, but nothing was found, and the patient died in forty-eight hours.

Post-mortem.—Some peritonitis. The small intestine occupied its usual place; it chiefly filled the right iliac fossa, in which the cæcum was sought in vain. That intestine, enormously distended, and as big as a stomach after a copious repast, was situated in the left hypochondrium in front of the stomach and the spleen, and lying on the transverse colon. The ascending colon was maintained *in situ* by its mesocolon, so that the enormously distended cæcum, carried into the left hypochondrium, was bent at an acute angle upon it. At the point of bending the distention of the cæcum ceased abruptly. It was easy to understand and to see that an obstruction had existed at this point, and had been increased by the pressure which the small intestine exerted upon the angle of union of the cæcum with the ascending colon. The twist was easily replaced. The absence of a mesocæcum had facilitated the displacement of the cæcum. The walls of the cæcum were red and thickened, and at certain points showed signs of a circular constriction. There the coats were so thinned that it would not have been long before several perforations

had formed. It was clear from all the evidence that the cæcum had been strangulated in the hernia, and then rejected by a violent reduction in the left hypochondrium, where it remained.

GROUP IV.

VOLVULUS OCCURRING WITHIN THE ABDOMEN FROM SOME PREDISPOSING CONDITION MORE OR LESS DIRECTLY CONNECTED WITH A HERNIA.

Numerically this group is of far less importance than might have been expected. In the two cases which can be understood, the volvulus seems to have been dependent upon a coil that had formerly occupied the hernia and had been the subject of an old local peritonitis.

Mr. Treves has pointed out that the approximation of the ends of such a coil produces a condition which is a well recognized predisposing cause of volvulus; but Case XV was the only instance met with which would appear to illustrate this.

There is plenty of evidence in the preceding pages that elongation of the mesentery may result from inclusion in hernial tumors, and it is reasonable to suppose that if a particular portion of this structure were in this way marked off from the rest, the coil attached to it might easily fall into a state of volvulus (*vide* Treves, "Intestinal Obstruction," second edition, p. 136), from its two ends being brought more or less together. But not a single case has been met with in which an uncomplicated intra-abdominal volvulus has owed its origin to this cause. Yet in many of the cases in Group II the elongation of mesentery that was present resulted from this cause, and was no doubt a factor of importance in the final twist.

On the other hand, Dr. J. K. Fowler's case (Case XVI) tends to show that the matted bowel resulting from a previously herniated loop may, by introducing a partial obstruction, lead to increased and tumultuous movements of the bowel; and these, other things being favorable, may determine the formation of a volvulus. And if such a complication can be brought about by an old inflamed loop that has been reduced, it is clear that an equal danger may attach to a loop that remains within the her-

nial sac, whether changed by inflammation or not, provided that it is capable of causing partial interference with the onward intestinal flow.

CASE XV.—Dr. Ed. Latham Ormerod. *London Medical Gazette*. New series. Vol. xii, 1851, p. 314.—A gentleman, aged fifty-six, began to be ill on August 20, 1849, with a little looseness of the bowels. Hiccough and vomiting set in early on the twenty-first. There was no abdominal pain. He had a large left inguinal hernia of many years' standing, for which he would never wear a truss. This could be replaced with ease and the ring admitted three fingers. On August 22 the abdomen was slightly tender on pressure on the left side, and a little later some abdominal catastrophe took place, and the patient died in less than thirty-six hours from the onset of vomiting and hiccough.

Post-mortem. There was peritonitis. The bowels were irregularly matted together here and there by old adhesions. One of these bundles of small intestine, which had lain in the sac, was generally dusky and œdematous, and in one of its coils was a fissure about an inch long, running exactly parallel to the valvulæ conniventes. To this extent the mucous membrane was congested, and in parts had been removed. Nothing was found to account for this injury by pressure on the bowel.

Dr. Ormerod, in discussing the pathology, says, "the most probable explanation seems to be that a single coil of intestine had become twisted on itself, so that the passage was obstructed above and below the point where the bowel gave way; and that the bowel, distended by its own secretions, and its coats always softened by habitual congestion, and now yet more by present inflammation, burst. Probably with the bursting of the bowel the obstacle to its replacement was removed, and with this all traces of the cause of obstruction were lost."

CASE XVI.—Dr. J. K. Fowler. *Lancet*, June 30, 1883, Vol. i, page 1119.—A man of forty was admitted into the Middlesex Hospital, with symptoms of intestinal obstruction. He had worn a truss for double inguinal rupture for some years. Both ruptures were easily reducible, and had never caused serious discomfort. Mr. Hulke operated and found a volvulus of the small intestine. There were also present, in the collapsed ileum below the volvulus, some adherent coils forming continuous V-shaped curves like a cracker. Their peri-

toneal covering was thickened from an old limited peritonitis. Death occurred three days later.

Post-mortem.—A portion of ileum eighteen inches in length, situated about two feet from the ileo-cæcal orifice, was somewhat congested and slightly diseased; the peritoneal coat was smooth and shiny. The *whole* mesentery was very long, measuring from seven to eight and one-half inches from the spine to its attachment to the intestine.

This case, presumably, is the one mentioned by Mr. Treves in the first edition of "Intestinal Obstruction," page 11, and certainly the one referred to in the second edition on page 136. In the first edition, it is suggested that the volvulus depended upon an unduly long mesentery resulting from hernia, but in the second edition a congenital origin is with better reason ascribed to the lengthy mesentery.

There is, however, some reason to suspect that the hernia was not altogether unconnected with the chain of events that culminated in the twist. The small group of adherent coils, the seat of an old limited peritonitis, situated in the two feet of the collapsed gut that intervened between the volvulus and the cæcum had most probably acquired that form from inclusion in one of the hernial sacs at some previous date. It was a condition that, doubtless, led at times to partial obstruction and to more vigorous intestinal movements in the small bowel immediately above it, and this, together with the favoring circumstance of an elongated mesentery, was probably the determining factor in the production of the volvulus.

CASE XVII.—Mons. L'Honneur. *Bulletin de la Société Anatomique de Paris*, 1856, page 158.—This was a case of crural hernia in a woman, who also had an internal strangulation. The hernia was reduced without difficulty, but death followed in half an hour.

Post-mortem—A loop of intestine three or four feet long, commencing three feet from the duodenum, was found twisted upon itself. The duodenum (?) (the query is the writer's) presented a little diverticulum which descended into the hernial pouch, and was fixed to its internal face by very strong adhesions.

It is impossible to say whether the volvulus was in any way associated with the hernia other than accidentally. The case is inserted here for what it is worth.

TRAUMATISMS INFLICTED BY ANIMALS.

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BITES and scratches from animals are, perhaps, not so frequent as we might suppose, and especially those from wild animals, yet they are sufficiently frequent to warrant the surgeon's careful attention.

Much has been written and many cases reported of scratches and bites from cats and dogs which have been followed by what was believed, by members of the medical profession, to be hydrophobia, but while the writer has seen numerous and severe as well as trivial traumatisms received from domestic as well as wild animals, he has yet to see one single case in which he was thoroughly convinced that the party suffered from hydrophobia; but, on the contrary, where disease did follow infection of such wounds, it has evidently been tetanus instead of hydrophobia.

It is unfortunate that in many instances where persons have been wounded by a dog or cat, the animals are killed without giving the attending physician an opportunity to determine whether such animals were afflicted with hydrophobia or not. We are of the firm belief that hydrophobia is contagious, and that the bite of the animal will not produce hydrophobia without the animal being afflicted with the disease itself. We are also of the firm belief that a punctured or lacerated wound due to the bite or scratch of an animal often is followed by tetanus. This is quite logical, owing to the fact that the habitat of the bacillus tetani is found in the earth and readily finds

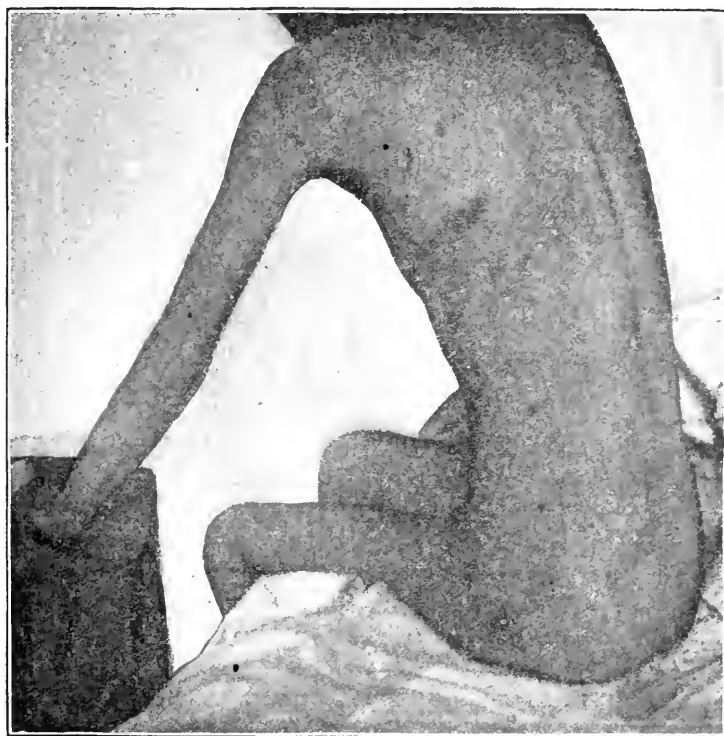
lodgement in the claws and teeth of domestic as well as wild animals, and in turn may be introduced into the human economy by a bite or scratch.

In the firm belief that every contagious disease is produced by specific pre-existing germs we do not believe that it is reasonable to anticipate the development of hydrophobia from an animal which did not have the disease at the time of injury. Certainly it would be very improbable for it to be conveyed by a scratch of a claw, but, on the other hand, we can readily understand how tetanus could be conveyed in this manner. In the hundreds of cat and dog bites which the author has seen and treated he has only seen a few cases that were afflicted with tetanus and none with hydrophobia. He recalls a case of a boy in which he was called in counsel, in Columbus, Ohio, some years ago, who was snapped by a small dog while playing with it, and in a few hours marked symptoms of tetanus followed, which by some was thought to be hydrophobia, but which was clearly of tetanic origin. The boy suffered from repeated spasms which threw him into the opisthotonos position, and which proved fatal in a few hours.

If the position taken by some medical men, that any animal bite is liable to be followed with hydrophobia, whether the animal has the disease or not, be true, we do not understand why we should not have severe injuries from wild beasts followed with such disease, as the larger and greater the number of punctures the more extended the field for infection.

Lion Bite.—I recall the case of a lion bite which occurred to one of the keepers of lions in a large show, who was severely bitten through the right thigh, April 19, 1896, while attending a lion in a cage at Columbus, Ohio. A young man, aged twenty-five years, was attacked by a lion who gave him one severe craunch, which pierced the thigh just below the large trochanter, one of the upper teeth passing through the flesh just outside of the femoral artery. The other upper tooth being broken off only contused the parts. The two lower canines passed through the vastus externus and under the quadriceps extensor, tearing the muscles from the bone, in addition to producing two large punctured wounds. The party was taken to the Protestant Hospital where the author treated him and converted the

punctured wounds into open wounds by free incisions, washing the parts thoroughly with peroxide of hydrogen. Gauze drainage was inserted for a few days, the wound was kept thoroughly cleansed and repair followed rapidly without suppuration, without a rise of temperature, and the patient had no symptoms of nervous irritability whatever; made a perfect recovery and was discharged from the hospital May 19, just four weeks after he was admitted.



Grizzly bear injuries.

Grizzly Bear Injury.—On June 21, 1899, David Doty, an old bear hunter of Piedmont, Wyoming, was admitted to the Wyoming General Hospital suffering from numerous severe lacerations, the result of coming in contact with an old she grizzly who bit and scratched him in a most frightful manner. The victim was sixty-two years of age, white, married, an American, and had spent a large portion of

his life in hunting, and with the exception of rheumatism had always been healthy.

On June 19, while out hunting, he came across a she grizzly with some cubs, and, unfortunately, ran on to them before he was aware they were in the brush. The first thing he knew he was struck by the huge paw of the grizzly and knocked down, when she immediately proceeded to scratch and bite him practically from head to foot, as will be shown in the accompanying photograph.

After having injured him in this terrible manner she voluntarily left him, after which he is reported to have shot her as she was walking away.

He was ten miles from home, and in this crippled condition managed to crawl to the nearest camp, some five miles distant, when he was taken to his home and sent to the hospital, arriving at the latter two days later. There were several severe lacerations of the scalp caused by the claws of the grizzly, which together with the tooth-bites on the body and the claw injuries aggregated in the neighborhood of one hundred wounds, extending altogether from the top of his head to the calf of the leg along the left side of the body. With one craunch of her powerful jaw she crushed the five lower ribs and tore through the soft parts, puncturing and crushing a portion of the lower lobe of the left lung. Another crush of the jaw loosened the flesh from the great trochanter of the left hip, and in addition to these the left arm and leg were bitten and scratched in many places.

Treatment consisted in cleansing the wounds thoroughly with bichloride evaporating solution,¹ packing or covering with gauze saturated with this solution and keeping the wounds as thoroughly cleansed as possible. Notwithstanding the strict antiseptic measures which were inaugurated, the large number of wounds and the time that had expired after the injury, together with devitalization of the tissues by the crush of the bear's monstrous jaws, caused more or less necrosis and suppuration of a few of the wounds. Constitutional disturbances were of little or no consequence until the third day, when he had a rise of temperature to $104\frac{1}{2}^{\circ}$ F. On the twenty-eighth day after the accident the temperature again rose to $104\frac{1}{2}^{\circ}$ F., but was quickly controlled by the discovery of a pocket of pus which formed in the

¹ Bichloride evaporating solution: eighty parts boracic acid solution, three per cent.; ten parts alcohol; ten parts glycerin; and eight drops of a saturated solution of bichloride of mercury to the pint. The saturated solution used being two ounces of hydrange bichloride to two ounces of alcohol and six ounces of glycerin; eight drops to the pint, equals 1 to 3500.

left pleura which was thoroughly cleansed; the temperature subsided and the patient made a rapid and uninterrupted recovery, and was discharged from the hospital August 12, 1899. A few days ago I heard from him, and learned that he was in good health and was preparing to look for more bears to conquer.

Remarks.—Here are two cases, the last one especially, in which lacerations of the body were simply terrific, and yet there was not the slightest symptom of hydrophobia or tetanus. The only constitutional disturbances which we had were those arising from the presence of pus, due to infection and necrotic tissue.

In the treatment of this class of cases we believe it to be essential that all punctured wounds be converted into open ones by free incision, thus enabling the surgeon to get access to every part of the lacerated and torn tissues, without which he is unable to cleanse them from infective material. If, on the other hand, this is accomplished, there is little to dread in the treatment of these wounds outside of pus infection, unless they involve some of the more vital parts. I have seen numerous punctured wounds apparently repaired, by first intention, but after a few weeks the temperature would rise, hectic symptoms present themselves, and on further examination a pocket of pus would be discovered somewhere, usually in the deeper parts of the punctured wound, not unfrequently producing extensive destruction and requiring a much more formidable operation than would have been necessary to have converted a punctured wound into an open one.

In the treatment of this class of wounds I find the so-called bichloride evaporating solution, the formula of which will be found in a foot-note, one of the most serviceable chemical preparations which I have had the pleasure of using. It is not irritating, and if thoroughly applied in the early stages it will, as a rule, destroy all infective germs. Constitutional treatment in these cases requires but little attention, outside of keeping the secretions active and occasionally the use of tonics.

ON THE USE OF FIXATION PLATES IN THE TREATMENT OF FRACTURES OF THE LEG.¹

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THE universal recognition of the principle of antiseptis has brought about so great a change in the treatment of fractures of the leg, that, excepting for injuries of the severest type, primary amputation is no longer resorted to, and is rarely practised even in hospitals with a large accident service.

This spirit of conservatism has brought into general practice methods formerly employed by the boldest only, and in our day every effort is made to save a leg, no matter how severely it may be crushed, as long as the important blood-vessels and nerves remain intact to nourish the injured limb.

We are prepared to enlarge existing wounds or to make free incisions in order to gain access to the broken ends of the bones, remove fragments, blood clots, bundles of soft tissues which by their interposition prevent coaptation. Sutures, pegs, screws and staples are employed to retain the fragments in apposition to secure union of bone and usefulness of the injured leg.

The application of the Röntgen discovery to the uses of surgery has further expanded the field of conservatism in supplementing the known diagnostic signs by furnishing the means for direct inspection of the broken bones; it enables us to obtain far more reliable information about the direction and the character of the fracture, as well as the position of the fragments than is possible by surface inspection and palpation alone. We can turn the information thus obtained to the purpose of securing greater perfection in the result of the treatment.

It seems that this marvellous discovery has not been accorded its full merit, and it is yet contended that it usually affords

¹ Read before the Philadelphia Academy of Surgery, November 6, 1899.

no better information than can be obtained by inspection and touch. Our own experience, limited though it be, bids us to place the highest estimate upon the value of the skiagram. Even if owing to the direction from which the shadow is cast upon the plate, it at times fails to indicate the line of simple fracture without displacement, on the other hand it does not picture to us fractures, fragments and displacements unless these exist; and instances are not rare where the Röntgen rays have revealed conditions that were not previously recognized.

The danger of the mere possibility of failing to recognize improper apposition of the ends of a broken bone, ought itself make the employment of the Röntgen rays imperative. Viewed from this stand-point, the Röntgen rays become a vital factor in preventing deformity and in securing undiminished usefulness in cases of even severe and complicated fractures of one or both bones of the leg. The result of the treatment, based upon the well-known symptoms alone, and consisting of reduction, application of splints, pads, casts and the like, is generally satisfactory; exceptionally, however, deformity of various degrees with attendant impairment of usefulness of the limb ensues, and the sensation experienced by the surgeon when he views the skiagraphic picture of the malunited tibia, and the consciousness that the deformity might have been prevented if the exact condition had been recognized at the proper time, convert him to the belief held by those who appreciate that the Röntgen discovery has extended the field wherein active surgical interference in cases of fractures of the leg is indicated.

Whenever it is decided to cut down upon a broken tibia for the purpose of securing apposition of the fragments, various methods are available. Among these are,—wire sutures, ivory pegs, steel screws and staples. Our own experience has formerly been limited to the employment of silver wire, variously applied, and whilst it requires considerable disturbance of the soft tissues in drilling through both surfaces of the bone for introduction of the suture, the wire often becomes loose and fails to maintain the fragments in apposition.

Better success has been obtained by the application of a

silver plate in the form of a cleat to the flat subcutaneous surface of the tibia secured by small galvanized steel screws. The method is simple in its execution, does not complicate the treatment, is capable of maintaining the fragments in unyielding apposition, and thereby shortens the time required for bony union. Its employment has served to restore broken legs to unimpaired function without shortening. The plate which is designed to meet the indications of any fracture of the diaphysis of the tibia, transverse or oblique, single or multiple, is made of silver one-sixteenth of an inch in thickness, three and one-half inches in length, and three-fourths of an inch wide with perforations for the screws one-half inch apart. The patient being anæsthetized, an incision slightly exceeding the length of the plate is made through the integument along the median line of the inner surface of the tibia, its centre corresponding to the line of fracture when the bone is broken in one place only, or corresponding to the centre of an additional fragment. The integument is loosened laterally, the periosteum not being disturbed. After removal of serrations, spicules of bone, blood clots, soft tissue and other interposed or extraneous substances, the fragments are moulded into position, the plate adjusted, and the drill applied through such of the perforations as are selected for the reception of screws. The drill, slightly smaller than the diameter of the screws to be employed, is carried through the compact structure of the bone till cessation of resistance indicates that the medullary cavity has been reached.

Two screws are usually employed at each end and are secured by means of an ordinary screw-driver. Considerable force is occasionally required to overcome the tendency to displacement of one of the fragments, and has to be applied by the hands of an assistant.

In cases where infection exists or may be expected to supervene, a counter-opening on the posterior surface of the leg must be made and a drainage-tube inserted. Coexisting fracture of the fibula may exceptionally require attention; ordinarily it adjusts itself fairly well when the tibia is properly set. The integument is united over the plate by means of three or

four interrupted silkworm-gut sutures. The leg is now placed in a fracture-box or a posterior splint of metal or felt.

After the expiration of about one week the limb may be placed in a silicate of soda case, fenestrated over the position of the plate and over the drainage-tube if one has been inserted, and it may be safe to permit the patient to sit up in a rolling-chair or to be about on crutches. In the simpler cases the wound is apt to unite by first intention, although there is secretion of sanguinolent pus between the plate and integument that may require an opening in the line of the incision for its escape, and can be maintained patulous by a small gauze or rubber drain. The cases of comminuted fracture and cases with infection may demand irrigation which cannot be readily employed when the limb is incased in a silicate case, and it may be preferable to employ a fracture box.

We have found it convenient to practice massage of the affected limb in the third week after the receipt of the injury to prevent the swelling so liable to ensue in these cases. The plate seems to be a harmless tenant in the leg, and is permitted to remain in position until bony union has taken place. Its removal is accomplished with the aid of local anæsthesia alone. The screws are found to sit firmly in the osseous tissue. The following four illustrative cases represent as many varieties of injury to the shaft of the tibia and fibula or tibia alone.

CASE I.—Miss M. L. K., aged thirty-two years, on May 27th, 1897, while riding a bicycle came in collision with a moving electrical street car and was dragged along for some distance. Admitted to the Polyclinic Hospital on the same day. On examination a fracture of the right tibia below its middle with the upper fragment slightly protruding through the skin was recognized. Marked loss of blood. Leg was washed, placed in a fracture box, and an ice cap applied over wet bichloride gauze. June 3, swelling and pain subsided, reduction by extension and counterextension, application of silicate of soda case. June 8, a Röntgen ray photograph was taken through the case and revealed an oblique fracture of the right tibia about its middle with serrations and projecting spicules of bone, the upper fragment projecting forward and inward, overlapping to the extent of three-fourths of an inch. Fibula broken at the junction of upper

and middle third, upper fragment displaced outward, likewise overlapping to the same extent. (Fig. 1.) The case was removed, the patient anæsthetized, and reduction attempted with the aid of the fluoroscope; the fragments could not be brought into accurate apposition.

On the following day the patient was anæsthetized with ether, an incision made over the seat of the fracture along the inner surface of the tibia, the ends of the bone exposed, serrations removed by means of bone forceps, and silver plate three and one-half inches long placed over the periosteum secured in place by two screws at each end, integument united with silkworm-gut sutures. June 25, a small sinus at upper end of the wound leads down to the plate, slight discharge of pus. June 26, silicate of soda case applied. June 28, patient left hospital. July 27, skiagraph taken through case shows good approximation of fragments and absence of firm callus. (Fig. 2.) August 17, plate removed under local ethyl chloride anæsthesia. Towards end of October discarded cane, is in excellent health. Two years later, October 28, 1899, skiagraph shows perfect union, lines of tibial fracture obliterated, that of fibula indicated by an oblique union of fragments. (Fig. 3.)

CASE II.—J. F., aged thirty-six years. Laborer in iron foundry. Admitted to the Polyclinic Hospital on June 25, 1898. While on an elevator this morning the sustaining rope broke, precipitating the cage in which he was standing to a distance of thirteen feet to the ground. The impact caused a fracture of both bones of the right leg about the junction of the middle with the lower third, a large irregular gaping wound, exposing the comminuted tibial fracture irregularly transverse, in direction with a square separate fragment driven into the soft tissues. The wound was irrigated, covered with wet bichloride gauze, the leg was placed in a fracture box and ice applied. Sedatives administered for relief of intense pain. Temperature on June 28, 99.2° F. June 29, temperature 102.6, morphine necessary. Good approximation impossible on account of comminution of bone, wound remains clean, constant irrigation with 1:4000 bichloride solution. Röntgen ray picture shows lateral displacement and loose fragments. (Fig. 4.) July 2, under ether anæsthesia a longitudinal incision over centre of inner surface of tibia down to the periosteum, the incision crosses the transverse wound of the leg, the broken ends of the tibia exposed. A large fragment replaced and a silver plate secured with two screws into the upper and two into the lower fragment (Fig. 5), suturing the incision and the wound in the integument over the plate with silkworm-gut. Wet bichloride gauze and a straight splint to



FIG. 1.—Showing broken tibia and fibula at different levels.

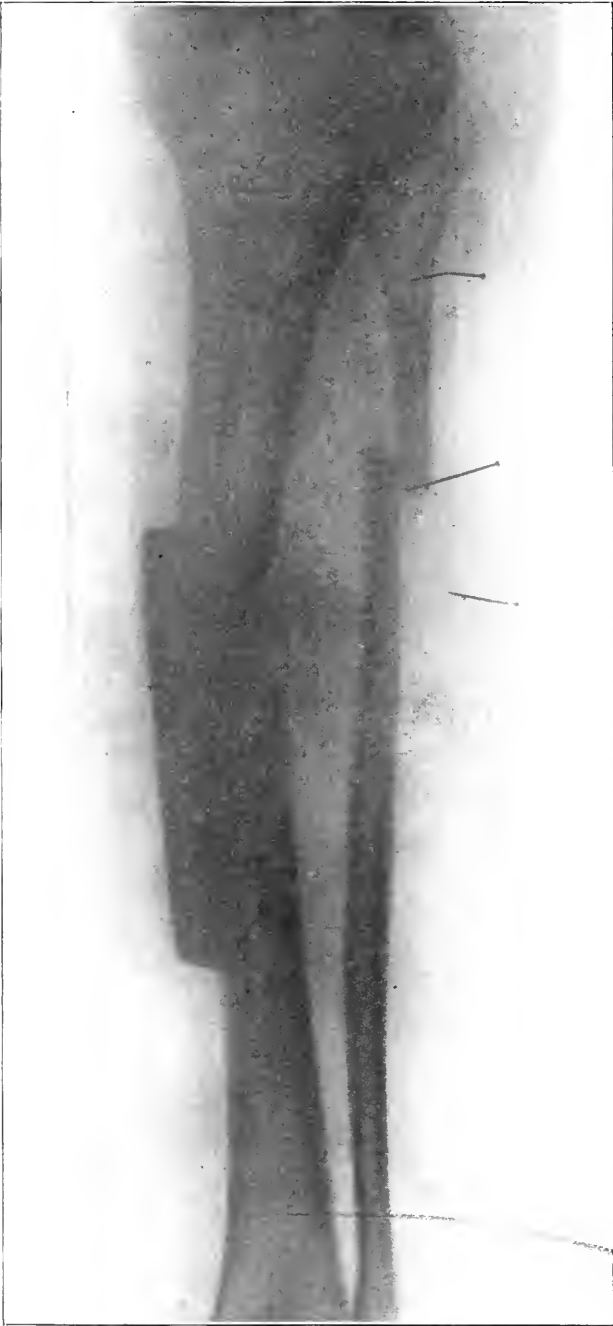


FIG. 2 —Showing good approximation and absence of firm callus.

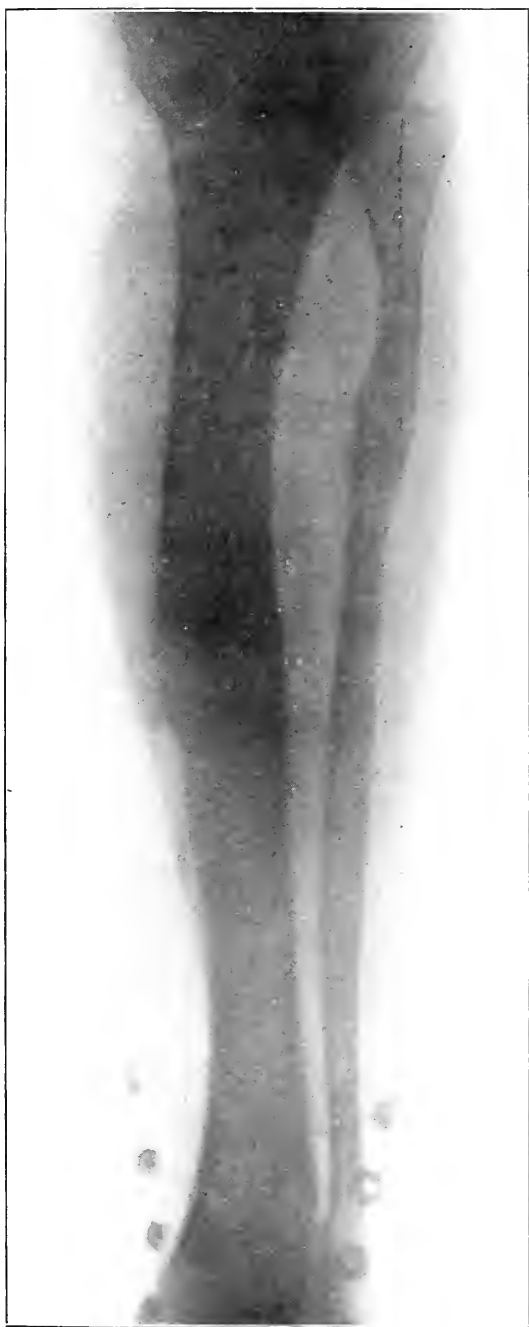


FIG. 3.—Perfect union, lines of tibial fracture obliterated.



FIG. 4.—Showing lateral displacement and loose fragments.



FIG. 5.—Fragment replaced and silver plate secured with two screws in the upper and two into the lower fragment.



FIG. 6.—Showing fragments unapproximated.



FIG. 7.—Showing fragments approximated and retained by silver plate.



FIG. 8.—Compound comminuted fracture of tibia and fibula, showing silver plate attached.

inside of leg applied with gauze roller bandage. July 12, a small slough of integument at intersection of incision with wound, partly exposing the plate, offensive odor, slight œdema, appearance healthy, temperature normal. July 16, fenestrated plaster case applied. July 26, wound contracting, no union. Patient has delirium and hallucinations for past ten days, requiring sedatives and tying to bed. August 1, much improved, is about in a wheeling chair in daytime. August 6, rise of temperature, pus behind and below fracture, no delirium. August 22, some dark, foul pus discharging from wound, no union, fragment of necrosed bone removed, temperature of low degree, irregular, at times subnormal; incisions made postero-laterally to drain pus pockets, syringing with hydrogen dioxide and bichloride solution. September 5, no union, marked œdema of the foot, general condition good. September 19, less œdema of the foot. October 18, chill, wound discharges pus, temperature 105° F. October 31, temperature normal, some union, some purulent discharge. November 1, patient passed under the care of Dr. T. S. K. Morton. November 6, case removed, union sufficiently firm to justify it. November 22, the plate is loose from the bone, tenderness about seat of injury, temperature 102° F., several pieces of necrotic bone extracted in ether anæsthesia, removal of silver plate, curettage of exposed part of medullary cavity, an abscess cavity, not in direct communication with the wound, incised from behind, pus evacuated and drainage established. November 29, temperature normal, no pain. December 14, patient left for his home on crutches. Bones firm, no shortening of leg.

CASE III.—Mr. J. D. L., aged thirty-five years. May 14, 1899, was thrown from his carriage while driving in the park, sustained fracture of left tibia. Attended by Drs. H. and K. Fracture reduced and plaster case applied immediately. May 15, Röntgen ray photograph shows a spiral fracture of the tibia about the junction of the middle with the lower third. The case was removed, the fracture reduced, a plaster case with steel splints applied, but the fragments were found unapproximated in the skiagram which was taken. (Fig. 6.) May 18, under ether anæsthesia an incision was made over the seat of the fracture, blood clots were removed, the ends offered resistance to reduction, and forcible approximation was necessary. A silver plate was applied and secured in position with four screws. (Fig. 7.) The wound was thoroughly cleansed and closed over the plate. The leg was placed in a fracture box. May 24, the stitches were removed, temperature was always normal. June 1, slight fluctuation

above the plate, puncture and evacuation of a thin sanguinolent pus, a small gauze drainage was inserted. The plate was removed on July 6, and the patient's recovery by this time was complete.

CASE IV.—J. F. D., aged thirty-nine years. Laborer in iron works. Was admitted to the Polyclinic Hospital on July 17, 1899, suffering with a compound comminuted fracture of the tibia and fibula. On July 20, a silver plate was applied by Dr. Stern (Fig. 8), and removed on September 26, 1899. On October 18, 1899, the patient was discharged from the hospital cured.

THE RELATIONSHIP BETWEEN CHOLECYSTITIS, JAUNDICE AND GALL-STONES.

BY ARCHIBALD MACLAREN, M.D.,

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THERE are a few points in the surgery of the biliary tracts that have proven of more than ordinary interest to me.

First in regard to the relationship between jaundice and gall-stones. My early impressions in regard to this subject as derived from text-books, left me with the idea that jaundice, more or less pronounced, was a necessary symptom of gall-stones. The teachings of to-day are not quite so decided, although most medical authorities are far from satisfactory when consulted upon this point. For instance, in Pepper's "System of Medicine," in speaking of the symptomatology of cholecystitis, he says, "inflammation of the gall tracts or gall-bladder is first announced by jaundice, which increases in intensity and color." Again, under the head of cholelithiasis he says, "jaundice is present in about one-half of the cases, and begins within a few hours after the onset of pain; it soon disappears unless the stone becomes impacted or encysted in the common duct, when it may proceed for months."

This statement, although somewhat qualified later, leaves one with the impression that jaundice is, to say the least, a most important symptom in making a differential diagnosis, and that in cholelithiasis the stone usually migrates.

Mayo Robson also leaves us with much the same impression when, in his work on the "Diseases of the Gall-bladder," he says that gall-stones are probably always accompanied by bladder inflammation, and this gives rise to a thick, ropy mucus, which in passing causes slight attacks of pain and jaundice. Further, he says that although jaundice in cholelithiasis is

usually produced by stones, it is frequently due to a catarrhal inflammation and thickening of the mucous membrane.

My own observations go to prove that these and similar text-book statements leave the impression on most medical minds that jaundice is a much more important symptom than it is in reality.

I have frequently been met with the remark that such and such a patient could not have gall-stones because he or she had never had jaundice.

Now there can be no question that jaundice is a very much overrated symptom, nor that many patients pass through an attack of cholecystitis and later carry stones for years without any discoloration of either the eyes or the skin, for since April 1, 1899, I have operated upon nine cases of gall-stones, and in not one of these cases has there ever been any jaundice at all. The reason for this may be the fact that probably none of them have passed gall-stones.

I am inclined to believe that the passage of gall-stones is rather an unusual occurrence. That when we speak of a patient as having biliary colic, we are apt to believe that the colic is due to the passage of gall-stones.

That such is not always the fact would be proven by these few cases, because in almost all of them, either through stricture or through wedging a stone in the cystic duct, the gall-bladder was shut off from the other biliary tracts. Still, all of these patients had suffered intense colic, and nearly all of them before operation had at different times to be relieved by hypodermic injections of morphine, several needing as high as a grain and one-half to two grains, before they were relieved from the pain. All of these cases gave the symptoms which are usually ascribed to the passage of gall-stones; in most of them the fæces were washed and strained through a sieve without finding a single stone, and, further, the conditions found at the operation were such as to preclude the possibility of the passage of a stone.

In all but one case the gall-bladder was found inflamed, thickened and frequently adherent to the neighboring organs, in one case producing a mechanical dilatation of the stomach,

through the influence of adhesions which existed between the gall-bladder and the pylorus, the conditions found to be present showing that the pain from which these cases had suffered was due to the cholecystitis, and not due to the passage of gall-stones. On the negative side of the question, most of the few operations I have done for chronic jaundice have proven to be inoperable malignant cases, usually of the liver. And in all of them the operation did no good, the patient dying in a few weeks. One other case, a patient of Dr. Solberg's, of St. Paul, proved not to be due to the liver at all. The pronounced jaundice with discoloration of the sclera and itching of the skin which had lasted for eight months was found to be due to a chronic suppurative appendicitis. The patient soon died after the operation, and a post-mortem examination demonstrated that there was no disease of the liver or the biliary passages, but that the jaundice was septic in character. Jaundice, due to the incarceration of gall-stones in the common duct, producing the ball-valve obstruction to the outflow of bile, which has been so well described by Fenger, is, I am sure, rare in comparison with the great majority of gall-stone cases. I have never found a stone in the common duct, and I do not believe that gall-stones migrate nearly as frequently as we have been inclined to believe.

I have found gall-stones impacted in the cystic duct several times; these have been removed through the gall-bladder without much difficulty, although it was necessary to crush most of them before they could be delivered. In one case it was necessary to incise the cystic duct before the stone could be removed. This case is one that was operated upon several years ago, and is the only case of gall-bladder surgery which has died after operation. This woman, like most of the others, was suffering an attack of cholecystitis at the time of the operation, and an infection caused an acute peritonitis, from which she died on the third day.

In the last case operated upon, six stones were found in the gall-bladder, while one of the same size, and fascetted like the others, was found embedded in the under surface of the liver, where it had become encapsulated after ulcerating its

way out of the gall-bladder. The relationship of cholecystitis and gall-stones is a most interesting and fruitful point for study and research. Clinically it would appear to me that inflammation of the gall-bladder is the first step in the majority of cases, and that the gall-stones are a secondary product of this inflammatory condition, being therefore a symptom rather than a disease. And since my attention has been called to this apparent relationship I have seen only one case which did not show either past or present evidences of inflammatory action of the gall-bladder.

This woman was a patient of Dr. Parks, of Downing, Wisconsin, was twenty-seven years of age, married sixteen years, two children, four miscarriages, the last being a criminal abortion, about one year ago. She has been very much of an invalid ever since that time, being confined to her bed the last month, suffering from constant pain in the left side which runs around to the small of the back. She has had constant pain in the pelvis, and a very irritable bladder, which necessitated her being up four or five times every night. Examination of the urine showed that it was practically normal. She had a retro-displaced, adherent uterus, and an enlarged movable right kidney. On November 10 we put her to sleep and examined the bladder, which was found to be normal, at the same time we catheterized the left ureter, the catheter being left in place over an hour without getting any urine. From this examination we were inclined to believe that the right kidney was doing all of the work.

On the 16th of this same month she was again anæsthetized and a laparotomy was made, the adherent uterus was liberated, the universal pelvic adhesions were separated and the left appendage was removed.

Wearing a rubber glove, I then introduced the whole hand into the abdomen for the purpose of examining the kidneys. They were found to be normal in size and gave no evidence of disease, but a gall-stone as large as a hickory-nut was found in the gall-bladder.

A. Bevan's incision was now made over the gall-bladder, which was found to be absolutely free from any evidence of inflammatory action.

This gall-stone was covered with numerous sharp points of cholesterine crystals and looked very much like a small chestnut bur. If any gall-stone could mechanically produce an inflammation this

stone certainly ought to have done so, while her history showed that she never had had the slightest pain from it, nor had given any of the ordinary symptoms of gall-stones.

Infection from micro-organisms may reach the gall-bladder, either from the intestine or through the blood-current, probably the latter is the most frequent route, the germs being filtered out of the general circulation by the liver. They then accumulate in the gall-bladder, the bile being proven to be a good culture medium, where, under favorable circumstances, they overpower the normal protecting endothelial cells and light up an attack of typhoidal, streptococcus, coli commune, or mixed cholecystitis. After a time the germs become attenuated, and later they clump to form a nucleus, around which cholesterine and the bile salts accumulate and form the nuclei for stones. A few points taken from medical literature that would go to prove this hypothesis are as follows: Cushing injected a culture of bacillus typhosus into the ear vein of a rabbit and in forty-eight hours found a pure culture of typhoid bacilli in the gall-bladder and duodenum. Other similar experiments were negative, but they would not offset one positive one. Flexner has obtained culture of typhoid bacillus from the bile in fifty per cent. of all fatal cases of typhoid fever in Johns Hopkins Hospital. Cushing found typhoid bacilli in the gall-bladder in cases operated upon for gall-stones, where the patient had never had typhoid fever.

Miller reports a case in which the bacillus typhosus was present in the gall-bladder seven years after an attack of typhoid fever. Von Bungen cites a similar case after fourteen and one-half years.

Chiri, Zeit and Hielk in twenty-two cases of typhoid found typhoid bacilli in the gall-bladder in nineteen, fifteen of which proved to be a pure culture. Westcott reports seventy-four cases of typhoid infection of the gall-bladder accompanying or following typhoid fever, of these thirty cases resulted in perforation; four were operated upon, three recovered, and one died, and twenty-six not operated upon all died. Gall-stones were found in eighteen of these seventy-four cases.

Different observers have found both living and dead micro-organisms in gall-stones. Dr. Henry S. Cushing, Assistant Surgeon of Johns Hopkins Hospital, now offers additional proof of the inflammatory origin of gall-stones by producing artificial stones. He says :

I am able to show to the Society some small biliary calculi of typhoidal origin obtained from the gall-bladder of rabbits, in both cases at the time of inoculation the biliary apparatus having been intentionally maltreated.

On one occasion the organisms (non-attenuated) were inoculated directly into the gall-bladder (?), which had to be held tightly for some time by a piece of gauze between the fingers to prevent leakage after the syringe was withdrawn.

At the autopsy, eight weeks later, three small millet-seed concretions were found adherent to the mucosa of an inflamed thickened and distended gall-bladder.

The second case (rabbit IX) is as follows :

March 17, 1898.—Inoculation of one cubic centimetre of twenty-four hour bouillon culture of bacillus typhosus into ear vein.

March 19.—Laparotomy. No evidence of inflammation. Culture and cover slips from gall-bladder and duodenum were negative for micro-organisms. Considerable traumatism of gall-bladder.

March 21.—Second inoculation of one cubic centimetre of eighteen-hour culture of bacillus typhosus into ear vein. Animal quite ill subsequently, but recovered.

June 13.—Widal reaction positive. Laparotomy. Marked evidence of cholecystitis. Gall-bladder bound up by adhesions in lappets in liver and identified with difficulty. One cubic centimetre of pale bile aspirated from the gall-bladder. Stained preparations showed a few rod-shaped organisms. Cultures: bacillus typhosus.

June 14.—Animal found dead. Autopsy. Peritonitis. Serosa greatly bile-stained. Gall-bladder thickened, congested and densely adherent to liver.

Contents: Small amount of pale mucoid material and three gall-stones. The largest is dark-colored, somewhat irregular in shape, measuring three millimetres in its longest diameter.

Decomposition had set in and bacterial observations were not made.

In conclusion I would like to report two cases of cholecystitis, in the first of which no gall-stones were found, the inflammatory process having not sufficiently subsided to allow of the attenuation of the germs and the formation of stones. While in the second case, where the acute process had but lately passed, leaving a subacute cystitis, the stones were evidently just commencing to form.

The first case, Mrs. O., was operated upon in March, 1898; patient of Dr. Henderson, forty years of age, had suffered from several attacks of biliary colic, usually accompanied with mild jaundice; the present attack commenced two weeks ago, the last few days becoming very serious, having had three rigors in the last thirty-six hours; temperature ranging between 104° F. and 105° F., her pulse between 130 and 140.

The gall-bladder was inflamed, the walls were very much thickened, recent adhesions existed between the gall-bladder and all the neighboring organs. Cholecystotomy was done, and the gall-bladder drained with a rubber drainage-tube. No gall-stones were found in the gall-bladder, and the patient promptly recovered and has had no further trouble with the gall-bladder.

The second case, Mrs. N., a patient of Dr. Beals, of West St. Paul, operated upon November 23, 1899, twenty-four years of age, had two children, the youngest one three months of age. Following the delivery of the last child this woman had a mild puerperal sepsis; she soon commenced to have pain in the gall-bladder, and has continued to have attacks of biliary colic ever since; had a constantly elevated temperature and pulse; the gall-bladder was found to be contracted back under the edge of the liver; the walls of the gall-bladder were a quarter of an inch thick; recent adhesions all over the gall-bladder, attaching it to the pylorus, producing a secondary dilatation of the stomach. Cholecystotomy showed that there was present an ounce of muco-purulent fluid; three small, hard, dark-colored gall-stones were found and removed, and a few days later five similar stones were found in the dressing. These stones were uniform in size and about as large as No. 4 bird-shot.

This patient promptly recovered and the sinus closed in four weeks.

ON THE PRINCIPLES INVOLVED IN THE IMMEDIATE HERMETIC SEALING OF ASEPTIC WOUNDS.¹

By HENRY O. MARCY, M.D.,

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It is impossible to discuss the present question without recurring *de novo* to the fundamental conditions of wound repair. The first striking contrast in the healing of wounds which interested Lord Lister in his earlier investigations was the reason why a compound fracture presented such dangerous complications, when the seeming addition to the simple fracture was only an opening through the cutaneous structures. It was easy to determine that it was not simply *per se* the superficial wound which added to the gravity of the danger. In what did it consist? The accepted answer to the question to-day is the addition of a certain known factor of a definite vitalized type—bacterial infection. Upon the exclusion of infective germs is based the revolution in modern surgery which has yielded such marvellous fruitage.

And yet the question may not be considered entirely settled, when distinguished practitioners like Dr. Granville Bantock, of London, and Dr. George Wilson, a prominent English medical health officer, and President of the Section of State Medicine at the annual meeting of the British Medical Association, furnish prominent addresses within the year, the keynote of which in both is that the constant presence of micro-organisms, now usually regarded as specific causes of disease, are associated with the disease only because they here find the conditions necessary for their development—that is to

¹ Read before the Southern Surgical and Gynecological Association, New Orleans, December, 1899.

say, that their presence is the result rather than the cause of the pathological conditions found. So impressed with this belief is Dr. Bantock, long one of the leading surgeons of London, that he concludes his address as follows: "All these things—which are facts, not opinions, capable of demonstration and proof—go to show that the modern doctrine of bacteriology is a gigantic mistake; that we are already at the parting of the ways, and that it is safe to predict that, ere long, it will come to be recognized that these various bacilli play a beneficent rôle in the economy of Nature."

Dr. Wilson concludes his interesting address thus: "In addition to the pathogenic microbe, there are always other conditions—conditions of soil and circumstances without which the microbe is powerless. With these conditions we can always deal more or less effectually, and our most successful efforts must always remain based on these lines."

For my own part, I am glad to have such able advocates as the above quoted authorities emphasize the proper consideration of this very important factor in wound treatment, as well as in disease, viz., the conditions of the structures with which we have to deal. Viewed from my stand-point, the consideration of the *soil* is of importance second only to that of the *seed* which may be implanted therein. Upon these two subdivisions of the question, their proper consideration and relationship, depend the whole practical deduction, the better methods of wound treatment.

With seeming singular temerity, Nature has harnessed in for constant beneficent service a variety of bacteria, the *misplacement* of which may be fraught with the direst disaster. Familiar illustrations of this are found in the life histories of the *bacillus coli communis*, which serves such an important rôle when exercising its normal function: it aids in the disintegration of the waste material within the alimentary canal. If, for any reason, unable to escape from the appendix vermiformis, its colonization within this member becomes fraught with the gravest danger.

The micrococcus albus is a constant factor from infancy to old age, aiding in the disintegration and destruction of the

dying epithelial cells of the skin. *Misplaced* beneath the integuments, their development may be the cause of the most serious consequences. The hand of the surgeon, on this account, is often the most dangerous factor in operative surgery, a fact the demonstration of which has been so often repeated that few now question its importance or gravity.

Having conceded the importance of bacteria as a cause of wound infection, the evidence of which is so conclusive and convincing that few will question it, our attention is very properly called to a careful consideration of the conditions and surroundings which render their probable development a dangerous factor to the individual. The simplest illustration of favorable conditions may be cited as follows: Given a localized germ infection in well-vitalized structures, as in the prick of a finger, and note the result. A detachment of Nature's flying cohorts, the white blood-cells, are immediately summoned, surround and shut in the growing colony, and, under favorable conditions, a minute abscess is the result—the expulsion of the invaders. In a simple incised wound, in well-vitalized aseptic structures, held at rest in coaptation, these same cells form a plastic reunion, and, little by little, become changed into connective tissue cells, and the repair process is complete.

Surgical technique may be defined as the art of making in aseptic structures an aseptic wound and maintaining it aseptic. To this end note the complexity of preparatory detail for any major operation. I will grant to a critic like Dr. Bantock that there can be little question but that, in the desire of many operators for originality of technique, the average surgeon is confused with much that is of little value, and that oftentimes, in the perplexity of the multitudinous minutiae, very important fundamental conditions are underestimated or ignored. Doubtless owing to this, more than anything else, has arisen the oft-repeated acrimonious discussions as to cleanliness in surgery, the use of antiseptics, etc.

It may be assumed that no one would claim that harm arises from a sterilized *circumfusa* of the part to be operated upon. If not harm and a possible good, any objection thereto is hypercritical. To attain this, antiseptics must be employed,

and, so far as possible, heat is the most satisfactory agent. This is easily applicable, by the usual methods of steam sterilizing, to towels, instruments, etc.; in fact, everything needful, except the living structures of patient, operator and assistants.

The demonstration is now ample that we have far less to fear from the bacteria floating in the atmosphere than was formerly believed. But even now few would have the hardihood to question the dangers which may arise from a dust-laden atmosphere. Hence, cleanliness must consist, in part at least, in a clean surgery, as far as possible free from dust-laden air-currents. The integuments of a patient about the operative site must also be clean, by which I mean the removal as far as possible of every loosened epithelial cell, secretions of the sweat-ducts, as well as the extraneous material which may be attached to the skin.

For the same purpose, and really far more important, is the care which must be given to the hands of the surgeon and his assistants. Repeated experiments of the most exact and convincing character have shown without a question the danger which may ever lurk under the finger-nail of the operator, even after the most careful mechanical and chemical disinfection. It is on this account that the sterilized rubber glove comes in as one of the most important of the recent contributions to aseptic operative technique. In addition to the above, irrigation of wounds with antiseptics is still thought valuable by very many of our best operators as a further precaution for maintaining a wound aseptic.

As will be noted, I have referred to technique in something of detail, for the purpose of showing the emphasis which most surgeons make upon painstaking aseptic methods, and which I must heartily approve and consider of the first importance.

The criticism that is to follow, however, has ample justification. The surgeon must not alone be a *scientist*, which includes the familiarity with a technique as outlined, to be carried out with the automatism of a well-mastered ritual; an equal familiarity with the anatomy of the parts and their relationship; but to this should be added other almost equal acquirements, those of the *artisan* and *artist*.

There is no excuse for bungling surgery; unskilful dissection, leaving tissues shreddy and half-disorganized; devitalizing the structures by the application of dozens of strong forceps, all done in a so-called painstaking technique; and, on this account, comes the well-merited, impatient protests of great surgeons like Dr. Bantock, with a justification for the appeal that the *soil* is as important as the *seed* in every surgical procedure. Add to the above picture the application of very many ligatures, no matter how fine and cut short, almost invariably applied with a force sufficient to necrose the inclosing tissues, and we may well wonder that Nature is able, even in aseptic wounds, to rescue the work from complete destruction, much more that it goes on to primary repair. The time certainly has arisen, since, unfortunately, now every tyro in the practice of medicine has an ambition to call himself a surgeon, that an earnest protest is made against the unnecessary mutilation of the structures operated upon, and that we hold up in admiration the earlier methods of the great masters in surgery, who prided themselves upon the rapidity and skill with which they made their clean-cut wounds.

In wound technique, then, what have we to advise? A recognition of the vitalized structures with which we have to deal. To injure them by clean dissections as little as possible, to remember that even the largest vessels require comparatively little force for their occlusion, and that coaptated, well-vitalized structures, held at rest, furnish a minimum of exudates; that it is of the first importance to preserve these for the repair of the tissues; that on this account the drainage-tube has been wisely abandoned, harmful as a foreign body, liable to be the "open door" for the ingress of bacterial infection and the very means of permitting the escape of Nature's "first aid to the wounded," the vitalized serous effusions, and leucocytic proliferation.

In all large aseptic wounds it is hard to overestimate the importance of the coaptation of like structures with their retention at rest. In order to accomplish this it is of the highest importance to rejoin in a careful way the structures by the use of buried sutures, and by a general consensus of the best surgeons these sutures should be absorbable, and for many

reasons I believe well selected, fine tendons furnish the preferable material. Without the actual demonstration as to cause, I have long since observed that the suture material serves a better purpose by being antiseptic rather than aseptic, and for this reason have urged the importance of soaking the tendon half an hour or more in a 1:1000 bichloride of mercury solution, taking the suture directly from the solution as required for use. One of the great advantages of wire is that it is impermeable. This pertains almost entirely to silkworm-gut, and scarcely in a less degree, for a considerable period, to well-selected and prepared tendon, while the *twist* in catgut and silk afford multiple recesses for foreign material.

One of the advantages of the rubber glove, of no secondary importance, is the safer handling of the suture material, since the irregular spaces of twisted sutures and ligatures, drawn through the unprotected fingers, frequently cause a dislodgement of infective epithelial cells. This, of course, pertains in a much less degree to smooth suture material, *e.g.*, wire, silkworm-gut, and tendon.

Tissues thus united by buried sutures leave no pockets for blood clots or effusions, the importance of which can scarcely be overestimated. The cleanly dissected structures, devitalized as little as possible, are best coaptated by fine continuous sutures, taken deeply through the parts from side to side which, when drawn upon, evenly coaptate the tissues and cross the line of incision at right angles, leaving no foreign material between the readjusted structures. The skin itself should be evenly coaptated by a subcuticular, continuous absorbable suture, applied in the same manner. In this way well-vitalized aseptic structures are held in even coaptation at rest. This having been effected, in aseptic wounds what further duty has the surgeon to perform to aid in the reparative process? To wit, namely, only to see that the infracted surfaces are protected during the process of repair from the invasion of bacterial infection. To this end we are all familiar with the most extraordinary, painstaking, and multiple processes of dressing devised and insisted upon as important earlier by the founder of antiseptic surgery. I think the largest criticism of modern

aseptic technique in wound treatment is in following these methods. Upon this I have insisted for many years, and very possibly this paper would not have been written had not a recent visit to a number of the leading hospitals in America demonstrated to me that such methods of wound treatment were still the routine practice of many of the prominent surgeons of our country.

Permit me a single illustration. A feeble boy of perhaps eight years of age had just been operated upon for the cure of an inguinal hernia. The only criticism as to technique worthy of mention was the closure of the skin by the through-and-through interrupted silk suture, for the purpose of coaptation, the sutures, of course, subsequently to be removed. Dusted with an antiseptic absorbent powder, sterilized gauze dressings were applied in many layers. These were retained by a roller bandage, over all thick masses of cotton, and splints were applied to both legs; the little fellow mummified with bandages to double his size, reaching from navel to knees. Wherefore, asked I of the distinguished surgeon? "Of doubtful value, but it has long been the custom in this hospital."

Granting that the protection was complete, which, however, I think exceedingly doubtful in children, because of urinary and fecal defilement; think of the torture inflicted by such methods of enforced restraint. What is the plea of the advocates of such dressings? That which pertained only recently to the retention of the drainage-tube, the escape of a possible imprisoned bacterium, and the absorption of a doubtful wound secretion, besides the prevention of ingress of extraneous material.

If our science, our theory, and practice go for anything, the making and maintaining of an aseptic wound in aseptic and well-vitalized structures is the practical issue sought and to be attained. This effected, with coaptated like structures held at rest by buried aseptic, absorbable sutures, the only factor remaining to complete our ideal technique is a dressing for the purpose of preventing subsequent infection. This is secured so simply and easily by iodoform collodion, strengthened by a few fibres of cotton, that this dressing reaches an ideal com-

pletion. It is *fluid-proof*, in that no exudate can escape from beneath it, and as a consequence it is *germ-proof*, in that by no means is it possible that any foreign material can enter the wound. Beyond this it holds in even coaptation at rest with a certain fixity of support the approximated parts. Water does not loosen it, and it is detached from the vivified cutaneous cells beneath only by the slow separation of the exfoliated epithelium. If, for any reason, it is needful to remove it, this is easily effected by soaking in alcohol or ether. The late Dr. John P. Maynard, of Dedham, first made the discovery that the cellulose of cotton fibre was soluble in ether and alcohol, and more than forty years ago gave to the profession this very valuable substance called collodion. Early it was applied for the sealing of wounds, those of a slight character oftentimes healing by primary union under its protection. It was popularly called "artificial cuticle," but naturally fell into disuse because when it covered septic wounds it was in the highest degree harmful.

Iodoform is soluble in it and is not injurious to it, and ordinarily I think it is of little additional value. Under certain conditions I believe it to be inhibitory to the development of the micrococcus albus in the proliferating epithelium, and quite as valuable in this direction as the silver salts, which are much more difficult of application. To one who may doubt the efficacy of a potent agent seemingly locked up in a collodion film we need only to cite the powerful vesiculating effect of the cantharidal collodion. A wound made and maintained aseptic in well-vitalized structures, held at rest in easy coaptation by buried tendon sutures, will be followed by a non-inflammatory primary union.

The fear, the anxiety, the constant supervision and watchfulness of nurse and attendant are entirely obviated. Wound supervision is finished before the patient leaves the surgery.

Subsequent dressing is of no avail except to keep the parts from extraneous injury. *The work of the surgeon for good or ill has its finality at the single period of manipulative intervention.*

THE SURGERY OF GASTRIC ULCERS.¹

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THE following cases are typical examples of gastric ulcer emergencies that of late have been subjected to surgical interference with a high degree of satisfaction.

The first is properly classified as perforating ulcer, which had given rise to cicatricial contracture of the pylorus and incidentally to extensive dilatation of the stomach.

The second as perforated ulcer with extravasation into the peritoneal cavity.

M. A. J., forty-five years of age. Habits regular. Family history negative. For several years prior to September, 1896, his health had gradually failed. Several times during this period he had entered the Southern Pacific Hospital, at Sacramento, California, complaining of obscure gastric disturbances, such as nausea, vomiting, anorexia and pain. Ordinary medical treatment was without avail.

Re-entered hospital September 22, 1896, looking pale, emaciated and apparently cachectic. He was extremely weak and despondent. There appeared to be a resistant mass over the pylorus, and palpation at this point was attended with great pain. There was entire absence of hydrochloric acid in the stomach contents. The stomach was greatly dilated. No history of hæmorrhage of any importance. A provisional diagnosis of cancer of the pylorus was made, and exploration advised.

Operation September 28, 1896. Median incision. The pylorus was enlarged, the walls being thickened and indurated. Suspecting malignancy, I at once excised the pylorus, removing the lower portion

¹ Read before the California Academy of Medicine, January 23, 1900.

of the stomach by a vertical incision and about two inches of the duodenum. There was no hæmorrhage. The stomach incision was carefully closed. It was then found that the free end of the duodenum could be readily attached by the button method to the anterior wall of the stomach near the greater curvature. Recovery was uninterrupted. Rectal feeding was resorted to for one week. The button was passed on the thirteenth day. Patient left the hospital on the thirtieth day. At this time he had a ravenous appetite, could digest a promiscuous menu and had gained flesh rapidly. He was last seen by me more than two years after the operation. At that time there were no gastric or enteric symptoms, and he had been continuously at work.

The specimen removed gave no evidence of malignancy. The inner surface of the pylorus presented two deep, well-defined, active perforating ulcers about the size of a five-cent piece. Another but smaller ulcer was found in the anterior surface of the stomach wall near the pylorus.

S. X. B., forty-two years of age. Salesman. Family history unimportant. Is a sparely built, rather delicate looking person, but well preserved.

He appeared at my office on the afternoon of October 23, 1899, seeking relief from a severe attack of diarrhœa which had overtaken him early that morning. He had spent the forenoon at the store of his employers, but was obliged to lay off at noon.

Upon inquiry I found there was a history of obscure enteric trouble, and accordingly I went over his abdomen carefully. The wall muscles were a trifle rigid. He complained of pain radiating from the umbilicus. Palpation revealed tenderness and pain in epigastrium and at McBurney's point. Temperature and pulse were normal. Having prescribed a palliative remedy he was sent home with instructions to report again the next day. At about one o'clock on the following morning, Dr. Johansen, of this city, was called to see him and at once reported to me by telephone that the patient was then in a state of profound collapse. At this time his temperature was 95.5° F., pulse 40, and he was bathed in cold perspiration. I at once repaired to his bedside. When I arrived he had rallied markedly under the administration of the usual stimulants by Dr. Johansen. At this time the man was suffering pain both at the epigastrium and over the appendix. Pressure elicited the greater protest when applied over the appendix. The abdominal muscles were perfectly rigid. The possibility of perforating gastric ulcer as a cause of

symptoms was considered, but the preponderance of testimony seemed to favor perforation of the appendix.

An operation was agreed upon, but could not be arranged for until 3 P.M., or fourteen hours after the acute attack.

The gridiron incision was made near McBurney's point. On exposing the cæcum and colon deposits of lymph were at once discovered. There were the usual evidences of chronic appendicitis, such as extensive adhesions completely fixing the colon, cæcum and appendix, while the latter organ was enlarged, distended and reddened. There was, however, no evidence of rupture or gangrene of this organ. This point being determined, the appendix was removed and search made for the origin of infection. Following along the surface of the ascending colon the lymph patches were more numerous as we approached the hepatic flexure. The gall-bladder was found to be healthy.

A median incision was then made above the umbilicus, and upon exposure of the stomach wall a round perforation was found in the anterior wall about two inches from the pylorus. The opening would readily admit a large white bean. Its margin was thickened, smooth and glossy. Through it had escaped a small amount of stomach contents and the adjacent tissues were more or less soiled. Having carefully sponged the infected area, the ulcer was infolded and the perforation closed by three layers of Lembert sutures. The abdominal cavity was freely flushed with saline solution, and a Mikulicz bag was inserted through the median incision.

Rectal feeding was maintained exclusively for four days and in part for one week. The drain was removed on the sixth day and the wound was allowed to heal by granulation. Convalescence was satisfactory, though slow, owing to the method of healing of the main wound. He left the hospital at the end of seven weeks. Since that time he has been at work almost constantly. His diet is liberal and promiscuous. Bowels move regularly and he has gained weight. On January 31, 1900, he reports having gained seven pounds in fourteen days.

A culture taken from a deposit of lymph first discovered in the region of the cæcum yielded a negative result. Unfortunately no investigation was made with reference to the extravasated material near the perforation.

Each of these cases illustrates the difficulties which attend the making of an accurate and timely diagnosis.

It is apparent that the chemical findings in the first case were wholly misleading; a fact only to be accounted for by the extreme atony of the organ whereby one of its most important functions was temporarily suspended. The previous history of pain, anorexia, vomiting and emaciation, together with apparent cachexia, were in accord with the theory of cancer, and rendered a correct inference wellnigh impossible.

In the second case there were no preliminary symptoms, either systematic or local, sufficient to engage the attention of the patient, much less to announce the presence of a possibly fatal lesion.

A brief statistical résumé will be of interest in this connection.

Bidwell (*The American Journal of the Medical Sciences*, September, 1899) makes a most favorable showing for operations done for the relief of gastric ulcer and its complications other than perforation and hæmorrhage. He has collected 242 such cases with thirty-two deaths, a mortality of 12.4 per cent. He quotes Cutler's and Elliott's estimate of the mortality following pylorotomy as 35 per cent. The mortality attending pyloroplasty is variously estimated at from 12 to 17 per cent.

Concerning operations for perforated ulcer, the same author refers significantly to Mickulicz's series of 103 cases. Of these, thirty-five cases were encountered previous to 1894, with but one recovery, a mortality of 97.15 per cent., while of the sixty-eight cases operated on since 1894, thirty-two recovered, a mortality of 52.94 per cent. Of fifty-five cases operated within the past three years, thirty-three recovered, a mortality of only 10 per cent. Combining this series with Mickulicz's later cases and we have 123 cases, of which sixty-five recovered, a mortality of 47 per cent.

As regards the most favorable time for operation, Lund's (*Boston Medical and Surgical Journal*, January 11, 1900) statistics are conclusive. In a series of forty-five cases operated upon within twelve hours after perforation, thirty-five recovered, a mortality of 22 per cent. Of seventy cases operated within twenty-four hours, forty-four recovered, a mortality of 37 per

cent. In a later series of forty cases collected by the same author, fourteen were operated within twelve hours, with twelve recoveries, a mortality of 14 per cent., and twenty-six within twenty-four hours, with nineteen recoveries, a mortality of 17 per cent.

EXCISION OF THE EXTERNAL TWO-THIRDS OF A
GASSERIAN GANGLION, BY THE HARTLEY-
KRAUSE METHOD, AFTER PRELIMINARY
LIGATION OF THE EXTERNAL
CAROTID ARTERY.¹

By JOSEPH M. SPELLISSY, M.D.,

OF PHILADELPHIA.

IT is due to the courtesy of Dr. Thomas G. Morton that it has been my privilege to operate on this case and to report it. By several years, it is yet too early to announce it as a cured case of trifacial neuralgia. It is, therefore, only published now to add to the scant existing testimony concerning the utility or fatuity of ligating the external carotid artery as a step preliminary to the Hartley-Krause method of excising the Gasserian ganglion.

CASE of H. S., fifty-five years of age, a blacksmith, who was admitted to the Orthopædic Hospital, of Philadelphia, on July 11, 1899.

The family history is negative. The past history: He does not use tobacco, takes alcohol moderately, and denies specific disease. During the past few months he has occasionally taken small amounts of laudanum to relieve the extreme pain of a right trifacial neuralgia. Excepting neuralgia, he has always enjoyed good health.

The present complaint is that of a right-sided facial neuralgia which began nine years ago. It followed sudden chilling immediately after hard work at blacksmithing. The pain at this time resembled toothache, and several teeth on the right, the affected side, were removed, but without relief.

Four years ago, April 22, 1895, the attacks of pain had become so severe, frequent, and of such duration that Dr. T. G. Morton ex-

¹ Read before the Philadelphia Academy of Surgery, November 6, 1899.

cised the right infra-orbital nerve. Eight months' relief from pain followed this operation.

February, 1896.—Nine months after the infra-orbital operation the right inferior dental nerve was excised by Dr. T. G. Morton. Eighteen months' relief from pain resulted.

July 11, 1899.—During the past two years the attacks of pain have increased in frequency, severity and duration. The acts of swallowing, of eating, and of washing the face provoke paroxysms of pain which are agonizing. Temporary relief is sometimes obtained by hard pressure against the cheek. He has been unable to work for some months. He suffers most at night, and cannot sleep till morning.

The physical examination found the heart, lungs, urine, muscular power and action and the sense of taste normal.

The nasal passages exhibited structural deformities and evidences of chronic disease, but not of sufficient degree to cause pressure and excite pain. The presence of pharyngitis and thickened vocal cords were also observed. The hearing is impaired.

The examination of the eyes, kindly made by Dr. A. G. Thomson, discovered in the left fundus a patch of choroiditis that suggested a specific history. The eyes were otherwise normal. The first, the infra-orbital, operation was followed by closure of the right lachrymal duct, and constant watering of the right eye.

The reflexes were normal, with the exception of the knee-jerks, which were impaired.

Sensation was hyperæsthetic in four areas of the right face: First, under the right eye; second, at the angle of the mouth; third, in the vicinity of the infra-orbital scar; and fourth, about the external auditory meatus.

The electrical reactions of the muscles of the face and head, for which I am indebted to Dr. Boyer, were of equal character. The weakest current was used to elicit the response, and even it caused much pain.

The patient was informed that the mortality of Gasserian ganglion removed was about 20 per cent., and he was advised not to run the grave risks of operation unless he considered that life, in his present condition, had become intolerable and not too dear to risk for the sake of at least temporary relief. He elected the operation; a date was set for it and the details of procedure considered.

The reports of operators and the memory of a Gasserian ganglion operation that I had witnessed gave me a wholesome respect for

middle meningeal hæmorrhage, and a readiness to try the effect of a preliminary ligation of the external carotid, as successfully practised by Fowler in his second Gasserian ganglion operation, for which he prepared, and was the first one to prepare, by an external carotid ligation. In his third operation he did his second preliminary ligation of the external carotid,—but this time, on raising the dura from the base of the skull he was so embarrassed by hæmorrhage that he had to pack with gauze and attempt the completion of the operation later, when he was again met by hæmorrhage, which prevented removal of the ganglion. The vessels from which the hæmorrhage came were not named.

The favorable results of L. McL. Tiffany, of Baltimore, obtained by excising the trunks of the second and third branches of the fifth nerve, and of the external two-thirds of the ganglion, that is,—the part of it that is in continuity with the trunks of the second and third branches,—led me to prefer this conservative procedure. It, from reported results, seemed to be sufficiently radical while being free from a history of subsequent loss of the eye on the affected side, such as has followed complete ganglion removal, with the division of the first or ophthalmic branch of the nerve in patients of Rose, Krause, Keen and also of Tiffany.

The day before the operation the carotid ligation and ganglion excision were rehearsed, respectively, on both sides of the head and neck of a cadaver. This proved a most valuable preparation and brought home the necessity, in cutting the bone flaps, to carry the bone cutting fully down to the level of the upper border of the zygoma, to insure a flap that hinges on a level with the floor of the skull. Failure to secure this much embarrasses the operation. The difficulty experienced and the care required for the separation of the dura from the floor of the skull, and from the ganglion itself, was a very necessary training.

July 19, 1899.—The operation was performed with the invaluable assistance of Dr. T. S. K. Morton. The external carotid was ligated near the angle of the jaw and above the hypoglossal nerve.¹ The aim was to tie above the facial and occipital arteries.

A Hartley-Krause flap was cut, chiselled and turned down on a level with the floor of the skull, and though the middle meningeal artery tunneled the bone of the flap and was cut transversely, there was no hæmorrhage. The dura was separated from the base of the

¹ Subsequent reference to dissections leaves me without doubt that I did tie above the arteries.

skull and then slightly slit, as recommended by Tiffany, to get rid of the cerebro-spinal fluid. An excellent view of the field of operation was thus obtained, there being no need of artificial light.

The second branch of the nerve, at the foramen rotundum, was secured by a ligature passed beneath it by a small aneurism needle. The third branch was seized at the foramen ovale by forceps. The two trunks were severed by a cutting hook and the distal ends tucked into the foramina. With the ligature and the forceps as a hold the external two-thirds of the ganglion was now dissected, cut, torn, and curetted away. It was most adherent and was removed in fragments too small to promise results from microscopic study.

A little venous oozing drained continually into the field of operation, which was, as it were, the bottom of a well, but kept in easy view by sponging, and there was at no time a flow of blood that could be called active hæmorrhage.

A gauze drain was left at the base of the brain and brought out at the posterior angle of the wound. The pericranium was sutured independently from the scalp so as to prevent depression of the bone flaps. Where the path of the bone cutting has been broad, depression of the bone flap may be prevented by inserting in each of its angles and in its summit a sterilized peg, to be received in a slot in the skull border opposite.

The eye was closed with adhesive plaster. The double operation occupied nearly two hours. The anæsthetic was ether.

The night of the day of operation the patient suffered from violent ether delirium. He was perfectly rational on the following morning, when the hyperæsthetic areas were found to have become anæsthetic. On account of the flow of cerebro-spinal fluid the dressings were twice reinforced in the first twenty-four hours, at the end of which some of the gauze packing was removed, and it was all out on the second day. The bowels were opened on the second day. On the third day a stitch that had slipped was re-introduced, after slight curetting of the neighboring edges of the wound. The temperature on this day reached its highest point, which was 100°. The convalescence was uneventful. The extremes of pulse rate were 110 and 65, and of respiration, 24 and 17. The stitches were out on the seventh and the patient in his chair on the eleventh day. He went to a shop to be fitted for goggles on the tenth, and was discharged on the thirty-first day.

For the care of the eye I am much indebted to the kind suggestion of Dr. William J. Taylor. It was washed several times a day

with boric acid solution and kept closed till fitted with goggles, which were worn as a protection for several weeks and gradually abandoned. Examination of the eye by Dr. Thomson at the time of the patient's discharge discovered no change resulting from the operation.

On examining the electrical reactions Dr. Boyer reported no change resulting from the operation, except that whereas before the muscles had responded to three and one-half milliamperes, which had caused pain, it took eight and one-half milliamperes after the operation to elicit muscular contraction, and it was unattended by pain.

Exhibition of Patient.—It is now two and a half months since the operation, and, excepting one momentary twinge, there has been no return of pain, but there is unequal action of the lower jaw and a dribbling of saliva, which in this instance are the price paid for release from neuralgic pain and for section of the motor fibres of the third branch of the fifth nerve. It was intended, as advised by Tiffany, to attempt the isolation and conservation of these fibres and so avoid this loss of jaw and cheek control, but the time occupied by the essential steps in this operation did not permit it. If the circumstances are favorable I think the effort should be made to save these fibres, and if I were again operating for Gasserian ganglion removal, my present experience would lead me to again, as a preliminary step, tie the external carotid.

TWO CASES OF ANOMALOUS SPINOUS PROCESS
OF SEVENTH CERVICAL VERTEBRA ARTICU-
LATING WITH THE SCAPULA.¹

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AND

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WITHIN a period of two weeks two patients were brought to the Orthopædic Department of the Jefferson Medical College Hospital, with conditions about the same.

The first patient was sent by Dr. W. F. Morrison, of this city, to determine what could be done for her shoulder, which was supposed to have been injured at birth. The child was seven years of age, of very slender build, and enjoyed excellent health. The history of perfectly normal birth was obtained, also that the condition was noticed soon after she was born and was thought to be a pressure paralysis occasioned in some way at the time of delivery.

Her general appearance was that of one affected with torticollis. The head seemed markedly drawn to the left side, and attempted movement to the right showed the cervical muscles on the left side to be much shortened and quite tense. (Fig. 1.) After being stripped, the seeming lateral turning of the head was found to depend upon the elevation of the shoulder (Fig. 2), and this in turn was readily observed to be firmly ankylosed to the spine. The spare condition of the child favored a very satisfactory examination, and permitted the outlining of all the spinous processes excepting that of the first dorsal.

¹ Read before the Philadelphia Academy of Surgery, November 6, 1899.

Movement at the scapulo-humeral joint was free and normal in all directions. When, however, both hands were put forward, the left was found about one and one-half inches shorter than the right ;

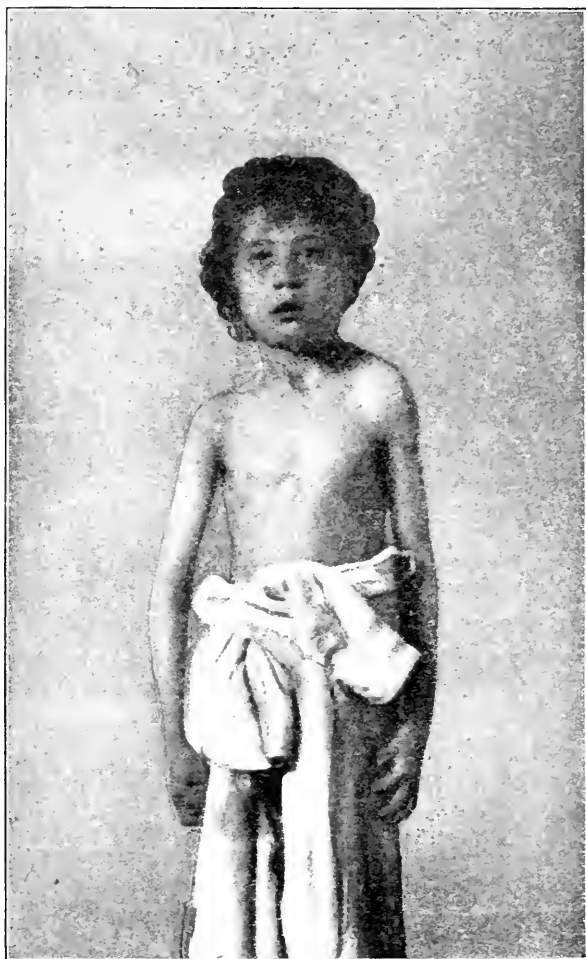


FIG. 1.—Case I.

also there was noted inability to stretch the arm directly upward (Figs. 3 and 4) when these movements were attempted ; the scapula was seen to move about a point at its posterior superior angle as a

centre, and could not be raised and lowered, moved forward or backward, or rotated as could the other one. The diagnosis of "anchoring of the scapula to the spine" was then made, and the case held under advisement.



FIG. 2.—Case I.

In two weeks the second case, a patient of Dr. L. E. Taubel, of this city, presented herself and was operated upon, as detailed later, and the uniformly good results obtained indicated a similar procedure

in the younger girl. The X-ray was used prior to operation, but for some undetermined reason a satisfactory negative was not obtained. The operation was performed on July 13, 1899, by Dr. Rugh, assisted by Dr. H. M. Righter and Dr. T. H. McGhee. The incision was



FIG. 3.--Case I.

made directly over the vertebro-scapular articulation, and the interposed bone readily exposed. The scapular end was first separated, the bone seized with strong forceps and cut off about one and one-half inches higher up. The scapula was then found freely movable.

The wound was dried and closed without drainage, and a large wedge-shaped pad, base upwards, placed in the axilla and the arm firmly bandaged to the side. Union by first intention occurred, and free gymnastic exercises were given to increase the mobility of the



FIG. 4.—Case I.

scapula. No pain or other unpleasant symptoms have followed the operation; the two shoulders are now the same length, and there is every reason to believe that when she has attained her growth there will be present no trace of her former condition.

The elder girl, aged sixteen, when seen by Dr. Wilson, who had not seen the first case, complained of limitation of motion of left shoulder, stating that the left shoulder blade was higher than the right, and had always been so.



FIG. 5.—Case II.

The statements were so similar to those made by patients with rotary-lateral curvature, except as to duration, that no further inquiry was made at that time, and inspection was made at once with the

shoulders and trunk bare above the waist. While standing at ease the left shoulder and scapula occupied a conspicuously higher position than normal, as shown in Fig. 5. With the index and next fingers placed upon either side of the spinous processes, the prominent process of the seventh cervical vertebra was taken as a starting-point to observe any deviation of the spinal column. At once there was observed to be some apparent irregularity, for instead of the usual ease of following the spines of the dorsal vertebræ, something seemed to divert the fingers to the left, which at first appeared to be a divergence of the entire spinal column.

This divergence appeared to be slight bending of the cervical and dorsal vertebræ, with the convexity to the left and with a very considerable amount of rotation, throwing the spinous processes in the line of the conspicuous irregularity above referred to. In bending forward to the extreme limit, the spinal column appeared to arch forward normally, and each of the methods usually resorted to for determination of rotary-lateral curvature demonstrated absence of that deformity.

Attention was now directed to the movements of the shoulders, and the patient was directed to raise both arms from the sides to above the head. In attempting this movement, as the arms reached a point of extension at the sides on a level with the shoulders, it was found that the left shoulder was markedly elevated and occupied a position nearer to the spinal column than the right. (Fig. 6.) The left arm could be raised high above the shoulders when the head was thrown to the right side, for which there was then no apparent explanation, but which, in the light of subsequent events, was clearly due to the ossific connection between the scapula and cervical vertebra.

The left shoulder was not only higher than the right, but was also nearer to the spinal column by one-half inch, which condition was associated with a marked increase in the curves of the left scapula.

Recourse was now had to the X-ray for information as to the condition of the bones, which could not be definitely ascertained by manual manipulative methods. The patient was placed upon her back upon a board table, and the Crooks tube placed directly over the median line of the neck at a height of twelve inches, and Mr. L. H. Prince obtained the photograph (Fig. 7). This showed the presence of an unnatural substance, having about the same density as the ribs in the same subject, and occupying an oblique position, which in

the photograph appeared to start from the cervical vertebræ somewhere below the skull and to extend to the left scapula. The spinal column was shown to be curved with concavity to the left, which is



FIG. 6.—Case II.

not in accord with cases of rotary-lateral curvature where the left scapula is higher. This observation entirely disproved the impressions gained by the previous manual examination. A second X-ray was taken with the patient in the same position as in the first, the Crooks

tube, however, being placed about eight inches to the left of the median line of the neck, and the resulting photograph (Fig. 8) is shown, confirming in every respect the conditions found in the first one.

It was now apparent that further and definite information could only be obtained by an exploratory incision, at which time this apparently supernumerary bone could be excised, if practicable. The conditions being explained to the patient and her family, and their full consent being obtained, the patient, on June 15, 1899, was etherized by Dr. H. M. Richter and operated upon by Dr. Wilson, assisted by Dr. Rugh. An incision was made in a line with the supernumerary bone, which was found to be placed superficially, having only a few muscular fibres between it and the skin. As soon as the bone was isolated throughout its length, its fibrous connection with the scapula was severed, and it was found that its upper end was firmly attached to the spinal column, for any motion in manipulation caused a corresponding motion of the head. The upper end was found to have an osseous union with the seventh cervical vertebra, and it was cut by bone forceps quite close thereto. There was no other spinous process for the seventh cervical vertebra. The wound was closed and the patient made an uninterrupted recovery.

The patient was drilled in a few gymnastic movements, which resulted in increased freedom of motion, and very little evidence of the former disability now remains. This patient was at various times taken to several hospitals in this city, but apparently without a correct diagnosis having been made, which is easily accounted for, inasmuch as she was subjected to the X-rays for the first time after she came to the Jefferson Hospital.

Prior to the time of the operation upon the elder girl, and with the X-ray pictures in hand, she was seen at our request by Dr. Harry M. Sherman, of San Francisco, Dr. J. Chalmers Da Costa, Dr. W. J. Hearn and many others, but no positive explanation of this growth was obtained, other than that it was a congenital anomaly of unique form. Dr. Sherman thought it might be an ossified rhomboid muscle; Drs. Da Costa, Hearn, and Wilson were non-committal; while Dr. Rugh, who alone had the advantage of carefully studying the case of the younger girl, believed that an elongated spinous process caused the condition present in both cases.

The bone removed from the elder girl (Fig. 9) was two inches long and one and three-quarters inches in circumference, being firmly attached at its spinal end by bony union, yet showing signs of having



FIG. 7.—Skiagraph showing patient in the directly antero-posterior position.



FIG. 8.—Skiagraph obliquely from left front, patient on back.

had other form of attachment in early life. At the scapular end there was a well-rounded articulating surface where it was in contact with the edge of the scapula. The bone is in shape, size, and general appearance an enlarged spinous process, having a very dense outer layer and reticulated inner part, and tapering from the base to the apex. It is not so flat as a rib, and shows no evidence of a groove on its under surface.

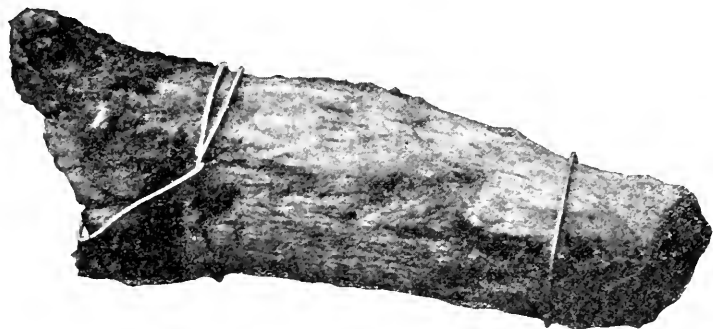


FIG. 9.

The bone removed from the younger girl (Fig. 10) was one and a quarter inches long and one and an eighth inches in circumference. At the spinal end there appears two small tuberosities, which, together with the space between them, were covered with articular cartilage, as was also the scapular end. These tuberosities gave the specimen the

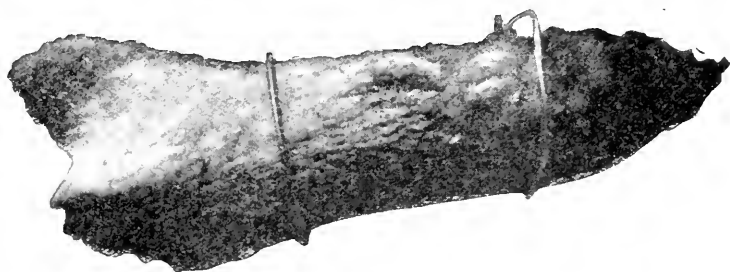


FIG. 10.

appearance of a spinous process, they being the parts which have attachment with the laminæ of the arch.

Francis L. Parker, in "Observations on Some Osteological Anomalies of the Vertebral Column" (*American Journal of the Medical Sciences*, 1869, n. s., lviii, p. 93), says that "unless associ-

ated with some variety of cranial deficiency, the cervical region is less involved than any of the others."

In searching for an explanation of these unique cases, no similar cases could be found in English, French, or German literature, the nearest approach thereto being found in what is termed cervical ribs.

John Struthers, in his paper "On Variations of the Vertebrae and Ribs in Man" (*Journal of Anatomy and Physiology*, London, 1874, ix, p. 17), says: "It is, however, common among quadrupeds to have the first rib articulating with the seventh cervical vertebra as well as with the first dorsal." He describes eleven specimens of cervical ribs attached to cervical vertebrae found in his dissecting-room in the University of Aberdeen. Nothing to correspond with these two cases now reported were referred to, and we believe them to be unique.

The characteristics of both specimens render justifiable the theory that there has been an extra centre of ossification for a spinous process, and this has been pushed or placed beyond the normal centre for the process of the seventh cervical vertebra, though this does not account for the fact that in both cases there was firm articulation with the scapula.

NEW OPERATING TABLE AND AN IMPROVED BOWL STAND.

By AUGUST SCHACHNER, M.D.,

OF LOUISVILLE, KY.,

PROFESSOR OF SURGERY IN THE LOUISVILLE MEDICAL COLLEGE.

AN ideal operating table should be as plain and simple as possible, it should be strong and easily cleaned and should enable the operator to secure every *really* necessary position in the easiest possible manner. Many tables are needlessly complex. Others do not allow the operator to approach every region as conveniently as they should, nor secure the different positions as easily as might be desired.

The Trendelenburg posture is secured on most tables by elevating the pelvis while the head is still on a horizontal plane. In such cases an acute angle in the neck is produced that at times appreciably embarrasses the respiration.

Since the introduction of the Kelly pad, or an improvised substitute made by rolling the edge of a rubber sheet in imitation of the Kelly pad, the excuse for the existence of a permanent drainage arrangement in connection with a table ceased to exist. With average care and the use of a Kelly pad we can with reasonable certainty lead the fluids to where we desire and prevent the more or less general soiling of the patient. It is proper that we should avail ourselves of this pad or its substitute whether the table has the so-called drainage facilities or not. If it has these facilities and we rely upon them we can confidently expect to find the patient to be well soaked with fluids before they begin to flow away by means of the drainage channels. So that this so-called drainage arrangement is at best a complete failure. In most tables the Trendelenburg

position is attained by the elevation of the pelvis which at the same time places the field of operation too high to be conveniently reached, or reached at all, without the aid of benches or other substitutes upon which the operator and his assistant may stand.

In this table the Trendelenburg position is obtained by lowering the upper half of the body instead of elevating the lower half. In accomplishing this, the table is made to "see-saw" from a point practically at the middle, which by utilizing gravity and making one-half of the body balance the other,

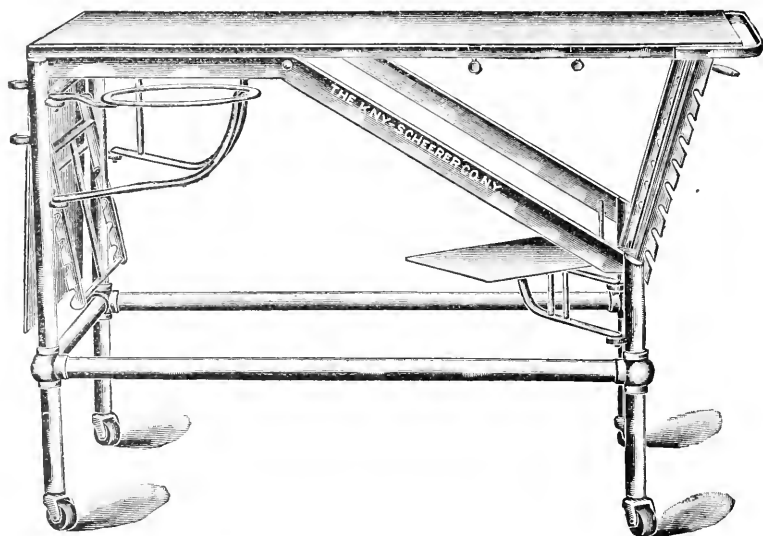


FIG. 1.—Table with most attachments removed.

the lowering is scarcely any easier than the elevation. This same feature has already been made use of in other tables—the Cleveland, Yarnall, Baldwin and others. But in none that I am aware of is it accomplished expressly through the efforts of the anæsthetizer. The changing of the patient into the Trendelenburg position on this table is accomplished in the simplest manner, so simple that the anæsthetizer can readily assume these additional duties without detracting from his already very important rôle, and I hold that this power should be in the possession of the anæsthetizer in preference to anyone

else connected or not connected with the operation, for the following reasons:

First.—Being of the easiest execution it can be carried out by the anæsthetizer, thus obviating the introduction of any outside assistance or jeopardizing the asepsis, by calling upon someone otherwise actively engaged in the operation.

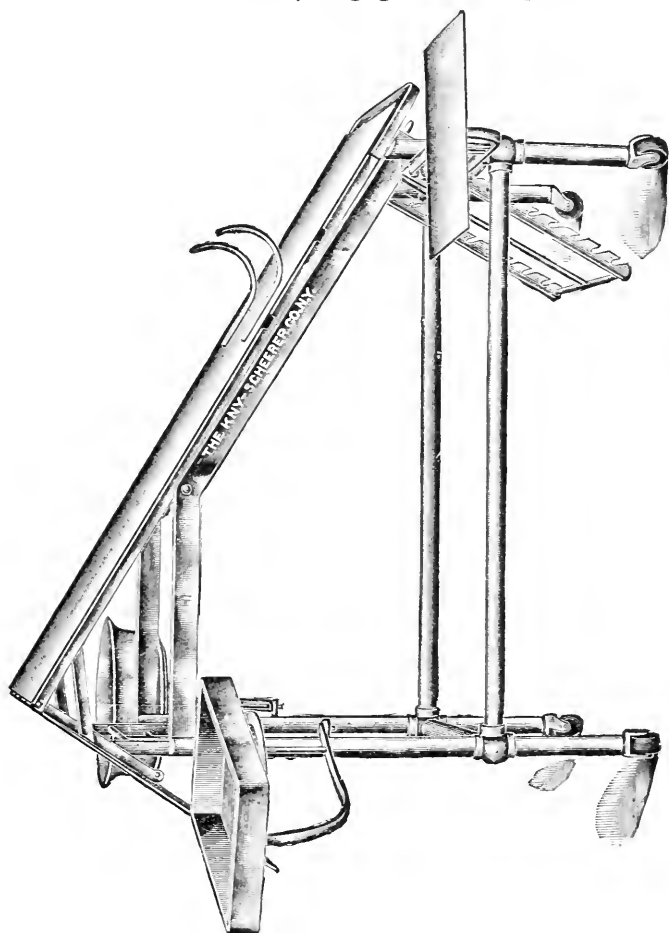


FIG. 2.—Showing table in the Trendelenburg posture.

Second.—Not infrequently it becomes advantageous in prolonged or severe operations, not necessarily abdominal, to more or less lower the upper half of the body with the view of overcoming the depressing effects of the operation. In such cases

the anæsthetizer above all others is the first to recognize and fully appreciate this depressing effect. Such being the case, it is no more than logical to expect those who first and fully recognize the trouble to first and fully apply the remedy for the trouble.

Third.—In the event of an accident with the narcosis, the anæsthetizer again should be first to recognize it, and should first apply or be able to apply the remedy of lowering the head,

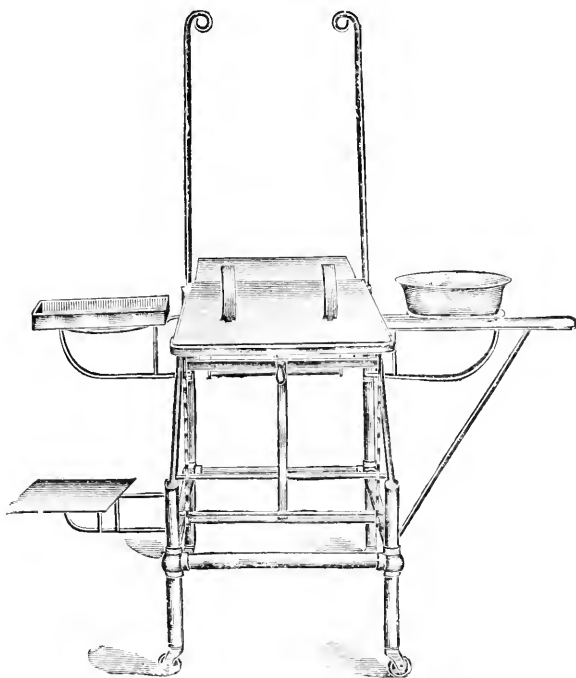


FIG. 3.—Showing table with all attachments in position.

etc. This lowering of the body can be carried out at a moment's notice, and without the formality of tying the lower extremities, since the possibility of slipping is provided for by two arcs which occupy a position above the shoulders and just external to the neck.

A second feature peculiar to this table are the attachments, which are intended to secure for the operator the maximum of convenience with the minimum of assistants. All of these

attachments can be swung under the table and out of the way or entirely removed. The first is a revolving platform that can be made to occupy any position in an almost complete circle by the tightening of a thumb-screw. This platform occupies an upper corner of the table and does service for the anæsthetizer. At the foot of the table on each side is a ring that swings in and out and serves to hold a bowl for the operator and the assistant's hands. Or in any operation in the perineal region with the patient in the lithotomy position one ring may be utilized for the hands and the others made to hold a tray containing the instruments, both being in convenient reach on each side of the operator. Or the tray of instruments may, in any operation, occupy the side taken by the assistant, and the other ring, holding a bowl, doing service for the operator. The rings have four holes to receive four small pegs on the bottom of the tray which prevents any accident to the latter. These pegs allow the tray to be arranged with the long axis of the table and *vice versa*. The rings into which these several attachments fit should occupy a point on the outside of the legs rather than towards the inner or more properly under the table as they are in these plates. This little change gives a wider swing in more useful directions. In lifting the table into the horizontal position, it is grasped by the arched iron at the head of the table which serves as a convenient handle. In engaging the last cog a little traction is necessary so that when this cog has engaged the cross-piece the whole table is as firm and as free from any wobble as though the side bars were present.

On either side of the table, just opposite the shoulder-rests, are two slots and thumb-screws that receive the two forks of arm extension. This extension may be applied on either side. Lastly, two uprights for supporting the lower extremities while in the lithotomy position and an extension plate by means of which the table can be transformed into a general operation table.

The bowl stand, or companion piece to the table, consists of a modification of a stand that has been in use for some time. Instead of two or three bowls this stand holds six, and practi-

cally occupying about the same space, and each within about as convenient reach as in the stand having but two or three. In this, as in the operating table, simplicity and convenience has been the chief aim. The stand revolves upon an axis and is easily moved about by dragging or pushing by means of the

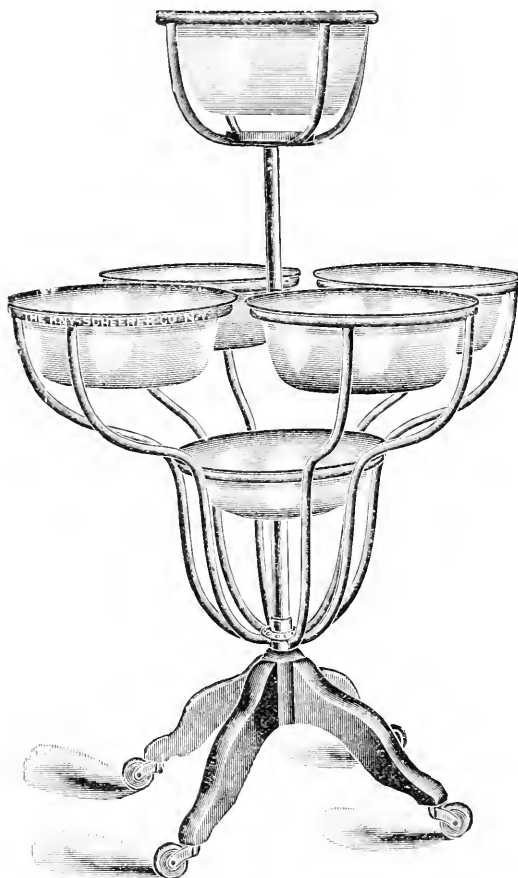


FIG. 4.—Showing stand with bowls in position.

foot. The bowls are arranged in the form of a spindle. In the middle are four bowls equally arranged about the centre. These in the beginning of the operation are charged with the desired fluids. As the fluid in one becomes unfit for further use, another is brought into play.

This enables the operator to complete the average operation without the inconvenience of supplying fresh bowls and the removal of the soiled ones. The bowl just beneath these is intended to receive the pathological structures removed and the sponges and gauze that have seen service and are ready to be consigned to the waste-bucket. The bowl above the group is so arranged that a small jeweller's lamp may be placed just beneath the bowl. By this means hot gauze pads are kept ready. This sixth bowl may be reserved for some special solution.

The table has been in use in the clinic of the Louisville Medical College since September last, and the stand has been in use for about four years. The practical advantages of each have been fully tested and proven.

CONICAL STUMP AFTER AMPUTATION IN CHILD- HOOD.

By CHARLES A. POWERS, M.D.,

OF DENVER.

IN August, 1899, while on a fishing trip in the northwestern part of Colorado, about eighty miles from the railroad, I was



FIG. 1.

accosted by a young man of eighteen years who said that he desired to show me the result of an improperly made amputa-

tion of the arm. This amputation had been done for a crush of the arm some ten years before. The young man said that directly after the amputation was made the stump was in excellent condition, and it so remained for two or three years, but after that the bone began to press against the soft parts at the end of the stump, and, in time, to come through. This process had been gradual. He held the physician who had done the original amputation responsible for the result.



FIG. 2.

On examination I found that the left arm had been amputated near the junction of its upper third with the lower two-thirds. The stump was in a typically conical condition, the pointed end of the fragment of the humerus coming through the soft parts. Figs. 1 and 2, taken with a pocket kodak which I chanced to carry, show the condition very well.

It is needless to say that the proper management of this would rest on the removal of a suitable amount of bone. But

these cases have an important aspect, and that is this: After amputation through the upper part of the arm or the upper part of the leg in childhood, a slow development of a conical condition is physiological and is to be expected. This is quite independent of the nature of the stump after the original amputation. It is because the humerus and the leg bones are developed in large part from their upper epiphyses. The growth takes place at these epiphyses and simply pushes the bone down through the soft parts. Some years ago I presented (*New York Medical Record*, June 7, 1890, and April 7, 1894) a



FIG. 3.—Conical stump in child's arm after intra-uterine amputation. Patient at eleven years of age. (Owen.)

number of these cases before the New York Academy of Medicine.

Unless the child's parents are warned by the surgeon at the time of the first amputation of what is likely to occur, they may blame him when the conical condition appears. The principle is a fixed one; it should find a place in our text-books and it should be taught to students.

Mr. Edmund Owen records (*The Practitioner*, January, 1899) an interesting case (Fig. 3) of this condition following amputation of the arm *in utero*.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, December 13, 1899.

The President, B. FARQUHAR CURTIS, M.D., in the Chair.

CIRRHOTIC ASCITES TREATED BY PERITONEAL ANASTOMOSIS.

DR. F. TILDEN BROWN presented a man forty-three years old, a laborer, who was at three different times a patient in the Presbyterian Hospital. At the time of his first admission, in July, 1898, he complained of indigestion, occasional vomiting, some dyspnœa, and a gradually increasing enlargement of the abdomen, besides swelling of the ankles and feet. The patient's history showed no syphilitic, tuberculous, or rheumatic disease. He had been an habitual user of alcohol for many years, chiefly in the form of whiskey. Abdominal paracentesis relieved the symptoms, and his general condition improving, he left the hospital during the following September. After continuing at his work for several weeks there was a gradual recurrence of his former symptoms, and he again entered the hospital on March 27, 1899. He stated that repeated attacks of diarrhœa had troubled him all winter. Physical examination at this time showed an abdomen moderately distended; it was tympanitic in the epigastric, hypochondriac and umbilical regions, dull in the lumbar and hypogastric regions. A fluid wave was appreciable. The edge of the liver was not palpable because of abdominal distention, but the area of percussion dulness was increased. The stomach tympany reached as high as the upper border of the fourth rib. The superficial veins of the abdomen were more distended than usual. There was slight cyanosis of the lower extremities. The circumference of the abdomen at the umbilicus was thirty-seven inches. The heart apex was not appreciable either by inspection or palpation; it was apparently

in the fourth space, just within the nipple line. The second sound of the heart was slightly accentuated. There was moderate icteroid of the face and conjunctivae. An examination of the right lung gave negative results. On the left side there was dulness posteriorly over the lower fourth and the respiration sounds were rather feeble. The pulse was of low tension; there was no appreciable thickening of the vessel-walls.

The patient was treated for eleven days with diuretics, when he became salivated. As during this time the circumference of the abdomen had decreased only about half an inch, paracentesis was resorted to on April 10, and the patient was discharged improved on April 28, 1899. After working one week his symptoms rapidly reappeared, and he was again admitted to the hospital on May 31, 1899. His abdomen was then more distended than it had been at any previous time, and he furthermore suffered from œdema of the scrotum and the lower extremities. The urine contained albumin and casts. There were evidences of endocardial trouble. The circumference of the abdomen at the umbilicus was thirty-nine inches. Abdominal paracentesis was again performed on June 1, 1899, and 356 ounces of serum were withdrawn; on June 14, 333 ounces; on June 23, 323 ounces; on July 5, 392 ounces; on July 18, 337 ounces; on July 27, 347 ounces; on August 10, 397 ounces; and on August 20, 381 ounces. The total quantity withdrawn in seven weeks was 2866 ounces. At this time the patient was losing ground. He was so well aware of his hopeless state that he readily accepted the proposal of the attending physician, Dr. Tuttle, that he be transferred to the surgical division for operation.

On September 1 the abdomen measured forty-one inches at the umbilicus. The patient was operated on the following day. Under chloroform anæsthesia a five-inch incision was made between the ensiform and umbilicus, and a two-inch incision above the symphysis. Upon the evacuation of the ascitic fluid the omentum was seen to be small, shrivelled and lumpy. The veins were large and tense. The lower margin of the omentum reached to the umbilicus, where it was adherent to the parietal peritoneum. The round ligament was the size of a finger and hard. The liver was hard and small; on its surfaces were the characteristic hob-nail lesions. The spleen was thought to be twice its normal size. The convexities of the liver and spleen, as well as the peritoneal surfaces opposed to them, were vigorously rubbed with dry gauze sponges grasped in metal holders. The parietal peritoneum fronting the omentum was treated in the same way before

suturing these tunics with chromicized catgut. There was but one transverse line of eight or ten sutures. The layers of the upper abdominal wound were separately closed in the usual way. Through the lower wound a glass tube, an inch and one-quarter in diameter, was inserted into the pelvis behind the bladder. Capillary drainage was provided for by sterile gauze introduced through the tube. Adhesive strips half encircling the trunk were drawn over the upper dressing from the ensiform to the umbilicus. For the vomiting, which was troublesome for forty-eight hours after the operation, champagne proved serviceable. The large gauze and cotton dressings had to be changed frequently, and the bed was often wet from serous overflow. At each change a syringe passed into the glass tube would generally remove from six to eight ounces of serum. During the second week the quantity of ascitic fluid was much less. There was primary healing of the upper wound. Compression of the lower part of the thorax and upper part of the abdomen was continued for three months. On the twenty-third day the large glass tube was changed for a smaller one. The patient was then sitting up in bed, eating and digesting solid food for the first time in seven months. His abdomen at the umbilicus measured thirty-five inches. On October 10 (the thirty-eighth day) the patient was out of bed and the drainage-tube was removed. On October 18 the abdomen measured thirty-two and one-half inches. On November 1 both wounds had closed. The abdomen measured thirty-two inches. The patient has a good appetite and his bowels are regular. His urine contains neither albumin nor casts.

DR. ROBERT F. WEIR said that less than a year ago, he had reported a similar case of his own, but in that instance the result was less gratifying, death having occurred within a week after the operation from peritonitis. As far back as 1892, Lens, a Dutch surgeon, published a case in which he opened the abdomen for ascites resulting from a cirrhotic liver, and in 1896, Drummond and Morison, of Newcastle-on-Tyne, reported two similar cases. Among the ten or twelve cases thus far on record, the mortality and failure is high—about 40 or 50 per cent.,—still, in the cases which recovered there has been a remarkable improvement, and in some a complete restoration to health. The operation is done with the idea of establishing an additional route by which the blood may be tortuously carried from the impeded portal vein into the general circulation. Dr. Weir said that in the hope of still further facilitating this he had attempted some experiments on animals, making an anastomosis between the portal

vein and the inferior vena cava or other veins of lesser size. The idea came to naught, however, as he found that Eck, in 1877, had similarly established such communication between the veins with unfortunate results. The explanation given by Eck was that the venous intestinal blood acted poisonously on the system when introduced so freely and without the assimilation of the liver, etc., into the general circulation. It is desirable that it should be taken up more slowly through the peritoneal adhesions.

DR. BROWN, in closing, referred to Dr. Weir's article on this subject, which was published in the *New York Medical Record* of February 4, of the present year. In Dr. Weir's case, where death resulted from peritonitis, it was thought that infection might have occurred in connection with the drainage apparatus, and Dr. Brown said that in his own case the question of satisfactory and safe drainage gave rise to considerable anxiety. He trusted to copious dressings, which were frequently changed, and to capillary drainage through a glass tube. The speaker said he thought continuous drainage was necessary in these severe cases, and even with every precaution, infection is likely to occur in a certain number of instances.

RESULT OF PLASTIC OPERATION ON UPPER LIP.

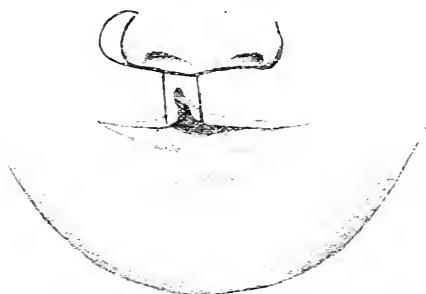
DR. CHARLES N. DOWD presented a middle-aged man upon whom he had performed a secondary operation for epithelioma of the upper lip. The patient had first come under his observation about four weeks ago, with a recurrent epithelioma of the upper lip. At the first operation a considerable portion of the lip had been removed, and there was a recurrence in the cicatrix, and a well-marked cicatricial upward retraction of the lip border similar to that which is sometimes seen after operations for harelip. Only a small amount of lip tissue remained.

Dr. Dowd excised the recurrent epithelioma and the cicatrix and then filled in the defect by sliding in tissue from each side. There was loose tissue in the cheeks, as there usually is in adults. Incisions were carried around the alæ of the nose, and in order to permit the sliding in of tissue from the cheek a crescentic piece was excised from the right side, as shown in the diagram. It was not necessary to excise this piece from the left side, as the defect was well filled in without it.

The cosmetic effect of this procedure was very satisfactory. The incision about the nose can scarcely be made out at present and little or no re-contraction has taken place.

Dr. Dowd brought up the question whether this same device

could be advantageously employed in operating on cases of harelip in children. The method is somewhat similar to Dieffenbach's,—that surgeon, however, did not remove the crescentic pieces of tissue from the cheek, but simply made the incisions and then stretched the tissues. The difficulty in applying the method to children is that in them there is likely to be a formation of fibrous tissue with subsequent retraction. In children there is a much greater tendency to the formation of keloids than in adults. The method, however, might surely be used advantageously in operating in adults for harelip or for the cicatricial contractions which are often seen following operations for harelip. Incisions about the alæ of the nose are often made in operating for cancer of the superior maxilla, and the scars are hardly to be seen.



Incisions used in reconstructing the upper lip.

DR. A. B. JOHNSON said he thought the result obtained by Dr. Dowd was exceedingly satisfactory. In one case of very extensive defect of the upper lip, the result of an ulceration which had occurred many years before, the speaker said he had resorted to a procedure which was similar to Malgaigne's operation on the lower lip. He took the tissue for a vermillion border from the inside of the mouth below the level of the lip instead of above, as is done in the usual operation. The result was fairly satisfactory. In that case, Dr. Johnson said, the defect was so extensive that he was doubtful whether the method described by Dr. Dowd could have been satisfactorily employed.

WEBBED-FINGERS.

DR. C. N. DOWD presented a boy who came under his observation last summer. He had previously been operated on for webbed-fingers; the primary condition consisting of an absence of the little finger, the three other fingers being included in the web.

Marked contraction of the fingers followed, and the boy was brought back for further treatment.

In order to correct the deformity Dr. Dowd performed a secondary operation, practically following the method of Zeller, which consists of two incisions on the dorsal aspect of the hand, the triangular flap thus made is reflected and the remainder of the web divided. The fingers are then separated widely, the flap is carried between them and joined to the borders of the cleft and the wound of the palm, the sides of the fingers were then skin-grafted.

When the patient left the hospital the fingers were quite straight, but later on considerable re-contraction occurred. By means of splints and rubbing they have again become fairly straight, but they are defective,—the flexor tendon of one and the extensor tendon of another are congenitally absent. There is no tendency to contraction in the finger which has no flexor tendon.

Dr. Dowd said that this case aptly illustrated the difficulties met with in treating this deformity. In spite of the beautiful illustrations seen in text-books, the result of the operation in real life was often far from satisfactory. He had, however, seen on that same day a case operated upon two years ago, where a severe form of contraction of the fingers followed. Under careful and persistent massage treatment the fingers have since become perfectly straight and the patient has good use of them.

HIP AMPUTATION FOR DIABETIC GANGRENE.

DR. GEORGE EMERSON BREWER presented a man aged fifty-four years, who was admitted to the surgical division of the City Hospital, in the spring of 1899, suffering with gangrene of the foot.

His general physical condition was bad, there was a large amount of sugar habitually present in the urine, and he suffered from thirst, polyuria, eczema and general weakness.

As the disease had been present for several weeks and seemed to be limited to the foot, and as a fairly well-marked red line was present, the house surgeon amputated at the upper third of the leg. He apparently did well for about eight days, the wound showing no evidence of infection. At this time, however, there appeared distinct evidences of necrosis of both flaps, which finally progressed to such an extent as to render a second amputation necessary. This was also done by the house surgeon, at a point just below the middle of the thigh. The same result followed, necrosis, but without infection.

An attempt was, however, made to bring about healing by care-

ful separation of the sloughs and frequent dressings, but without success. Extensive necrosis occurred, and as the wound subsequently became badly infected, amputation at the hip-joint was proposed, as affording him the only hope of saving life.

As his condition seemed critical the following method was employed.

The parts were prepared in the usual manner and covered with a wet bichloride dressing. The bowels thoroughly moved by calomel and a saline draught. One-third of a grain of morphine was administered hypodermically one hour after operation, and one-twentieth of a grain of strychnine, one-half hour later. Fifteen minutes before operation he had an enema of a pint of hot coffee.

He was then brought to the operating-room and placed in position on the table and everything prepared so that the operation could be performed without the slightest delay. Chloroform was then administered, and as he was already drowsy from the morphine, he quickly became unconscious, and during the entire operation took only about two drachms of the anæsthetic, the Wyeth pins were used and a circular incision through the skin was made, about three inches below the trochanter. The muscles were then divided about two inches above this, and the trochanter and neck of the bone exposed by an external vertical cut. Disarticulation was easily effected, the larger vessels secured, the wound generously packed with sterile gauze and partly united with silkworm-gut sutures. The time consumed from the entry of the first pin to the end of the dressing was a trifle over seventeen minutes.

The patient's condition improved after the operation, although both drain openings subsequently became mildly infected, and closed very slowly. His general condition, however, has markedly improved.

AMPUTATION AT HIP FOR CHRONIC OSTEOMYELITIS OF THE FEMUR.

DR. BREWER presented a man, aged fifty-six years, who was admitted to the surgical service of the City Hospital about one year ago, where he underwent an amputation of the thigh by a colleague. When Dr. Brewer went on duty in May he found that the wound had not healed and that there was extensive disease of the femur.

As his general physical condition was fair a disarticulation at the hip was advised as the only operative intervention which promised a cure.

He was accordingly prepared in the usual manner, and the same procedure followed as in the other patient. Owing, however, to a slight delay in securing one or two vessels, the operation was somewhat longer in duration, the time being twenty-three minutes to the end of the dressing. As his tissues were presumably healthy, the wound was almost completely closed, one gauze drain only being employed. His recovery was uneventful.

DR. BREWER, in reply to a question, said that in the diabetic case the arteries, even the femoral, were quite hard, and there was some question whether the ligatures would hold. In the other case there was no trouble with the arteries.

In the first case the primary amputation was done in April, the third was done the following June.

DR. ROBERT H. M. DAWBARN said that while the result obtained by Dr. Brewer in both of his cases of amputation at the hip was very satisfactory, and one to be proud of, the question arose in his mind whether it might not have been safer, instead of doing a disarticulation, to have simply sawn through the femur, leaving the head, neck, and greater trochanter? And whether in most cases where the joint is disarticulated, it would not be better, instead, to do a high amputation through the thigh bone?

In the ordinary Furneaux Jordan (Brashear) disarticulation it will be found that the same skin-flaps will comfortably cover the head, neck and trochanter major, if these are left. The lower amputation is much the quicker, hence the safer, and involves less severance of muscles, less dead spaces.

Dr. Dawbarn said that it seemed to him that practically no crushing injury should justify hip-joint amputation, nor ought gangrene of the leg to do so. Only three conditions warrant disarticulation as compared with severance of the limb a little lower. These are (1) tubercular coxalgia too grave for other measures than amputation, (2) extensive necrosis of the femur, and (3) malignant disease of the femur.

DR. BREWER said that in his second case, disarticulation was done because of extensive disease of the femur. In the first case he resorted to disarticulation in preference to sawing through the bone below the trochanter because he thought time could be saved by so doing.

OSTEOPLASTIC RESECTION OF THE SKULL AND CORTICAL EXCISION. EPILEPSY.

DR. BREWER presented a man who was shown to the Society about one year ago, after an unsuccessful attempt to remove a lesion over the left motor area.

His history shows a traumatism eight years ago, which was followed by epilepsy, which gradually increased in severity and was finally accompanied by a progressive paralysis of the muscles of the right arm and leg.

When admitted to the City Hospital in January of this year he was having frequent attacks of *grand mal*,—often two or three times a day,—was unable to use his right arm and walked with great difficulty.

The indications of a cortical lesion were so evident that an exploratory osteoplastic resection was made over the left motor area.

When the bone-flap was raised and the dura excised, an extensive adhesion was found to exist between the dura and cortex of the brain. On attempting to remove the dura this was found to be caused by an extremely vascular inflammatory exudate which extended beyond the limits of the incision, and at the time seemed inoperable. After controlling the rather free hæmorrhage which resulted from the exploratory tear of the dura the wound was closed.

He remained in bed about two weeks, the wound healed permanently, and no untoward symptoms followed the exploration,—in fact, the paresis of the arm and leg seemed decidedly less marked, owing, probably, to the fact that the bone-flap was allowed to project slightly above the surrounding bone and thus relieved to some extent the pressure of the exudate over the motor area.

About six weeks after his recovery Dr. Joseph Collins and Dr. E. D. Fisher saw him in consultation.

After a thorough examination both of these gentlemen expressed the opinion that removal of the exudate, unless accompanied by an extensive cortical excision, would probably have no effect upon the epilepsy, as there were present well-marked evidences of cortical degeneration. They advised a long course of potassium iodide, and if no improvement followed, a cortical excision.

This advice was followed, and as no improvement was noted after nearly two months of energetic antisyphilitic treatment, and as the epileptic seizures were increasing in frequency (six to eight a day), he

was again anæsthetized on May 10, and a large osteoplastic flap raised, exposing the motor area.

Although the exudate observed at the last operation was much diminished in thickness and was far less vascular, it, together with the underlying cortex, was cut away to a depth of about five-eighths of an inch, the piece removed being about the size of a dollar.

The hæmorrhage was surprisingly slight and easily controlled, the dura replaced, and the bone-flap returned and secured.

Almost complete paralysis of the arm and an increased paralysis of the leg followed the operation, and the fits increased to such an extent that he would have from forty to fifty a day.

There was, however, no infection of the wound, which healed primarily. About ten days after the operation, and after a most exhausting series of almost continuous convulsions, they ceased suddenly, and for a period of nearly two months he was entirely free from them. Since that time he has had but ten in eight months, and has improved in every way except in the paralysis, which is practically the same.

The pathological examination of the specimen revealed nothing in particular, excepting that it was inflammatory in character.

EPITHELIOMA OF CHEEK AND LOWER JAW, REMOVAL OF THE GROWTH AND ONE-HALF OF THE JAW. NO RECURRENCE AFTER FOUR YEARS.

DR. ALEXANDER B. JOHNSON presented a man, fifty-six years of age, who was admitted to the Roosevelt Hospital, November 21, 1895.

One year before, without apparent cause, he had noticed a small lump upon the mucous membrane of the gum opposite the first molar tooth of the lower jaw. This lump was hard and only slightly painful and soon underwent ulceration, spreading to the bone and into the tissues of the cheek. The increase in size has been slow. The patient says he has lost some flesh and strength. There is no history of syphilis. He had all the teeth of the lower jaw of that side removed. Upon entrance to the hospital physical examination showed on the inner side of the right cheek that there is a somewhat diffuse, indurated area, measuring roughly an inch and a half horizontally by one inch in vertical diameter. The mass was hard, slightly tender, adherent to the ramus of the jaw; it involved the entire thickness of the cheek. Upon the surface of the mucous membrane over the growth there is a

rounded ulcer with a smooth base, raised and everted edges, and from which a watery discharge may be expressed.

There is no ulceration upon the skin, but the integument is infiltrated, puckered and adherent to the growth. There are two enlarged, hard, movable, lymphatic glands in the submaxillary region of that side. The patient is rather anæmic and has a slight continuous fever.

On November 27, 1898, the patient was operated upon under ether in the following manner :

A quadrilateral incision was made through the skin of the cheek, including a space one inch square, which was adherent to the growth. Two quadrilateral flaps were then dissected up from the tissues of the cheek, each an inch wide, one above the quadrilateral, circumscribed area, the other below ; so that by being pulled upward and downward respectively, they would cover the defect caused by its removal.

From the centre of the quadrilateral area an incision was then carried horizontally forward to the angle of the mouth. A similar incision was carried outward and backward to a point opposite the middle ascending ramus of the jaw.

The growth in the cheek was then excised in the healthy structures. The horizontal ramus of the jaw was found infiltrated with the growth. The bone was severed in the median line in front with the saw and disarticulated at the temporo-maxillary articulation. One-half of the jaw was thus removed. The submaxillary triangle was then cleaned out, including the infected lymphatics and the submaxillary glands.

After the removal of the jaw the wound in the mucous membrane was sutured with catgut, the wounds in the skin with silk. A small drainage-tube was inserted into the submaxillary space through a small incision in the skin.

The microscopic diagnosis showed that the growth in the cheek was a typical epithelioma. Nearly the whole of the alveolar process and a considerable part of the horizontal ramus of the jaw were found infiltrated with disease of the same character. The lymphatic glands removed were also found to be carcinomatous. The patient was fed only per rectum for several days, and his mouth was kept clean by frequent applications of hydrogen peroxide. The wound healed by primary union. At the present time, a little more than four years after this operation, the patient is in good health, with no sign of recurrence.

The functional result appears to be quite good ; there seems to

be no tendency for the remaining half of the jaw to be displaced unduly towards the operated side; and, although the patient had no teeth in the remaining half of the jaw, his gums are tough, and he states that he is able to chew beefsteak in a satisfactory manner.

SURGERY IN THE PRESENCE OF SUGAR IN THE URINE.

DR. ARTHUR L. FISK read a paper with the above title, for which see page 321.

DR. A. B. JOHNSON said he could recall only two cases where he was called upon to amputate for diabetic gangrene. One was a middle-aged man who was suffering from gangrene of several toes. The superficial arteries were hard, and the urine contained a very large percentage of sugar. He first amputated through the middle of the leg, and the flaps promptly became gangrenous. He then re-amputated just above the knee, and gangrene again followed. The third amputation was done near the middle of the thigh; the flaps remained healthy and the man recovered from the operation. The hæmorrhage was very slight.

The second was an elderly man whose urine contained much sugar. One toe had become gangrenous, and this had spread as a phlegmonous process along the sole of the foot. An amputation was done through the middle of the leg, and the patient did well for about five days; then he became comatose and died two days later.

DR. HOWARD LILIENTHAL said he had seen quite a number of these cases, especially at the Mount Sinai Hospital, where many cases of diabetes are treated. He had seen several cases where lower operations preceded the higher ones; he remembered only one case where the final operation was below the knee. In that instance,—a patient of Dr. Gerster's,—the gangrene was confined to several toes and the dorsum of the foot; an attempt was first made to perform a Syme's operation, and eventually amputation was done about six or seven inches below the knee. The flaps did not become gangrenous, but there was considerable necrosis of the tendons and intramuscular fascia.

Dr. Lilienthal said he had amputated at least half a dozen times for diabetic gangrene, and had never considered it worth while to operate below the knee. The Esmarch was used in all of his cases. The speaker said that he noticed when very long skin-flaps were left there was a necrosis, beginning as marginal and sometimes extending and vitiating the entire result. It struck him that this ten-

dency to gangrene might be diminished by using skin and muscle flaps, and he had adopted this plan some years ago. Long skin- and muscle-flaps should be employed, making no part of the flap of skin alone, and taking the further precaution to omit all primary sutures. The wound is lightly packed with gauze, and a few sutures are put in, but are not drawn tight for two or three days.

Dr. Lilienthal said he had operated on a number of cases where healing was very slow on account of necrosis of the fascia, and because of the presence of small particles of necrotic bone; but since he has adopted the method of leaving large skin and muscle flaps he has not seen a single instance where real gangrene of the flaps followed. The speaker said that Dr. Fisk, in his paper, had made no mention of diabetes in the young. In youthful individuals a certain type of diabetes occurs which is peculiarly malignant. The rules, therefore, which have been laid down in regard to operating upon adults who suffer from diabetes must be modified when we are dealing with children, and only operations of emergency should be undertaken, as the disease usually runs a rapidly fatal course in these patients.

Dr. WEIR said that in amputating for diabetic gangrene it was generally conceded that the higher operations were preferable in respect to operations other than gangrene. In former years, the speaker said, he had felt some hesitation about surgical intervention in diabetic patients, but since then, under proper antiseptic precautions, he had found that wounds in diabetics might be said to do just as well, or nearly so, as those in other persons. The mishaps are just as rare in one class as in the other. After severe operations on diabetics it is true that we have greater shock, and this fact must be kept in mind. The resisting power of these patients has become impaired. Then, again, if the wound does unfortunately become septic, the constitutional symptoms are graver than in ordinary cases. Dr. Weir said he recently did an amputation of the shoulder in a diabetic case, and the result was perfectly satisfactory; of course, every precaution was taken to put the patient in as good condition as possible preparatory to operating.

Dr. BREWER said he thought a distinction should be made between different kinds of diabetes. A distinction is usually made between those patients from whose urine the sugar will disappear under a regulated diet and those upon whom diet apparently has no effect. The former class of cases are usually much less serious than the latter and the prognosis is better. At the City Hospital many amputations had been done for diabetic gangrene, but he could only

recall one case where an amputation below the knee proved successful. In that case the sugar afterwards disappeared from the urine. In another case there was apparent recovery after a series of amputations. In a third case, after several re-amputations, the patient died suddenly; the cause of his death could not be made out.

DR. CHARLES L. GIBSON said that glycosuria, which he thought was more or less transient in character, was not infrequently encountered in women about the time of the menopause. The speaker said he had formerly felt some hesitation about operating upon these women under such circumstances, but he had since learned to approach them in a different spirit. He recalled two cases, one requiring hysterectomy, and one with a large ovarian cyst, who had been refused operation because of the presence of sugar in the urine. Subsequently, however, as their condition grew worse, they were operated on, and both made an excellent recovery. The speaker said he did not regard cases of this kind as true diabetes.

DR. FISK, in closing the discussion, said that surgical operations in youthful diabetics, to which class Dr. Lilienthal had referred, would probably be in the line of emergency operations.

The consensus of opinion in regard to wounds in diabetics seems to be that while the wounds heal more slowly than in ordinary cases, infection, when it occurs, is always from without, and that the constitutional symptoms following such infection are very grave.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, November 6, 1899.

The President, RICHARD H. HARTE, M.D., in the Chair.

PYLOROPLASTY FOR NON-MALIGNANT STRICTURE.

DR. JOHN B. ROBERTS presented a man, fifty-five years of age, who had suffered with gastric symptoms accompanied by vomiting for fifteen or eighteen years. It was difficult to get from him an explicit history by which the exact date of the beginning of the vomiting could be ascertained. He, however, had been getting worse for the past year. He was greatly emaciated and vomited nearly all food taken. Eructations and intestinal flatulence were more or less constant symptoms when he first came under the reporter's observation in February, 1899. The character of the material vomited was suggestive of dilated stomach. This diagnosis was confirmed by physical examination, which showed the lower border of the stomach to be much lower than normal. The diagnosis reached was that the case was one of gastric dilatation, probably due to a non-malignant contraction of the pyloric orifice. The other organs of the patient seemed to be normal.

On April 4, 1899, a section was made through the abdominal wall, by which the pyloric end of the stomach was brought into view; a longitudinal incision through the anterior wall of the pylorus was then made. No tumor was found, but the muscular tissue surrounding the pylorus seemed to have become to a large extent fibrous. There was no distinct evidence of a cicatrix from previous ulceration, and no irregular puckering of the tissues. The longitudinal incision was sutured, as in the well-known operation of pyloroplasty, at right angles to the line of incision so as to increase the calibre of the orifice. The stomach seemed dilated, but there was no special evidence of it being displaced downwards.

The man promptly recovered from the operation, has gained many pounds in weight, and when seen a few weeks ago said that he could eat anything and digest it without difficulty.

Dr. Roberts added that in 1896 he operated upon a man who was thought to have a slowly growing infiltrating carcinoma of the pylorus. The patient had violent attacks of pain in the gastric region, and was willing to submit to operation because of his suffering. When the abdomen was opened and the stomach explored with the finger, no tumor was found and no contraction of the pyloric orifice. The patient made a prompt recovery from the operative procedure, and subsequently was greatly improved in his symptoms. He later, however, had some return of pain. The further history of the case is unknown. It was probably a case of gastralgia.

These two cases are of interest, as showing the ease and simplicity with which aseptic exploration of the stomach can be done, and emphasize further the fact that obscure cases are with propriety subjected to exploratory incision. The second case shows the difficulty of making the diagnosis even with the advantages now possessed by the profession in investigation of disorders of the stomach.

GASTRO-JEJUNOSTOMY.

DR. ROBERTS reported the following case: R. F., a man aged thirty-five years, who had had symptoms of pyloric obstruction for three or four years, was operated upon by him at the Polyclinic Hospital in November, 1895. He made an anastomosis by linear incision and suturing between the stomach and the jejunum. The patient died on the second day after operation after having had a temperature reaching 104° . An examination of the abdomen and seat of operation after death showed, however, no special evidence of septic inflammation.

INTESTINAL ANASTOMOSIS.

DR. ROBERTS presented a specimen showing a lateral anastomosis of the colon and sigmoid flexure made with the Murphy button three months previous to death. The patient was operated upon because of a spontaneous fecal fistule in the left lumbar region resulting from malignant disease of the sigmoid flexure causing stricture. As the connection made by intestinal anastomosis did not divert the entire stream of feces from the fistula in the loin, he re-opened the abdomen, and three months after the original operation extracted a portion of

sigmoid flexure containing the malignant growth and the fæcal fistula. The intestine above and below the excised portion was then united end-to-end by means of a Murphy button. Death occurred from sepsis the day after the operation. The specimen showed the lateral anastomosis three months old with an opening not much contracted, and at the same time exhibits the second end-to-end anastomosis, which, however, has not had time to become united.

EXTIRPATION OF GASSERIAN GANGLION.

DR. JOSEPH M. SPELLISSY reported two cases of Gasserian ganglion extirpation, for the details of which see page 463.

DR. GWILYM G. DAVIS remarked as to the nutrition of the flap, that he had heard of a case sometime ago in which following the ligation of the external carotid artery the flap sloughed. The flap is cut with its base downwards; therefore, that cuts the vessels coming from above, and, ligating the external carotid, deprives it of blood from below. It is evident that in this case the nutrition of the flap was preserved, but it seems that it is not always so. A method of avoiding the possible occurrence of this disturbance of circulation would be by cutting the flap with its base upwards, instead of its base downwards. Then the circulation of the flap would continue through the blood-vessels, across the scalp, for the circulation in the scalp is very free and extensive.

DR. ADDINELL HEWSON said that the deep temporal artery comes from the internal maxillary and not from the temporal,—the terminal of the external carotid. The flap can be nourished from the branches of the internal maxillary artery. There are several temporal branches from that, and it does not require the temporal branches of the external carotid to nourish it, so that in performing the operation, as Dr. Spellissy did, he did the proper thing. He cut into the artery before he got to the portion of the internal maxillary. If he ligated below he would cut off the meningeal branches, of course, but if he ligated above, his object was to preserve the facial, so that he might get anastomosis with the flap through the facial artery and through the occipital. If he ligates below the internal maxillary artery he stops his middle meningeal, but if he ligates in the position he did, he allows the anastomosis to take place between the occipital and the superficial branches of the facial with anastomosis of the temporal.

DR. DAVIS rejoined that as he understood it, this ligation occurred below the internal maxillary. The internal maxillary is given

off quite high up. The ligation in this case, he believed Dr. Spellissy said, was behind the angle of the jaw, that is, considerably below the internal maxillary. Therefore, no blood could have been supplied from the deep temporal arteries, nor the meningeal, nor the tympanic, small meningeal, or other various muscular branches. It was probably nourished from the facial.

DR. JOSEPH M. SPELLISSY said that the life of the flap was to be credited much to its good care by Dr. T. S. K. Morton. When its circulation was most in danger, when it was turned down during the operation and subjected to pressure, he gave it substantial help by keeping it warm with moist gauze. At the time of the operation, and for several days after, Dr. Spellissy was ignorant of the terminal history of the case to which Dr. Davis alluded. That the artery had been tied as a preliminary step and had been followed by immunity from middle meningeal hæmorrhage was known; but it was not known that the flap in this case had afterwards sloughed. Had Dr. Spellissy been aware of this he might not have dared to tie the external carotid artery, and had he learned it immediately after operating he would then have kept warm, moist dressings on the flap for a couple of days subsequent to the operation. The event, however, shows that such extraordinary precaution was unnecessary in the case reported.

CASES OF ANOMALOUS SPINOUS PROCESS OF THE SEVENTH CERVICAL VERTEBRA ARTICULAT- ING WITH THE SCAPULA.

DR. H. AUGUSTUS WILSON presented two patients and read the histories connected therewith, for which see page 468.

DR. DE FOREST WILLARD said, that from personal experience he should say that these cases were absolutely unique. If he had ever seen such a condition, he had never recognized it. He could realize that such a condition might exist and on casual examination be taken for a lateral curvature or torticollis. He could not understand how a false rib could arise from the spinous process,—it would more probably spring from the lateral process—neither could he understand how the spinous process could become attached to the internal upper angle of the scapula, for in embryonic life the scapula in its natural condition is a considerable distance from the spinous process. There must have been some developmental fault with abnormal bone growth to have produced this condition which has been heretofore unrecognized.

So far as he could understand from the history, this was not an outgrowth or a prolongation from the spinous process, but was a bone articulated to it, and also to the scapula, extending directly across and adjoining the two. It would seem to be one of those congenital conditions of development that sometimes occur, but which are exceedingly rare. If this is an exostosis it is certainly in a very peculiar position. He saw a girl last week who had from fifteen to twenty of these exostoses, the tendency to proliferation being very marked in her case, but none of the growths resembling either of these specimens.

DR. ADDINELL HEWSON remarked that there might possibly be some explanation, judging from the formation of the supernumerary ribs as given in some of the works on anatomy on the subject. In the supernumerary rib we are told that the formation of that rib grows from the lower portion of that rib above and from the interarticular cartilage, and it seemed to him that there might have been a prolongation of this outwards along the body of the vertebra, and thence out along the canal to the spinous process. It is merely a surmise.

Then another point of explanation might come into this, in that the projection of the spinous process, as was hinted at by Dr. Willard, the spinous process might have been greatly enlarged and abnormally developed.

His idea was, on first seeing the case, instead of the spinous process being a simple knob, as it should be in the upper thoracic region, it has obtained more of the view of the spinous process in the cervical region which, above the seventh, ought to be bifid. It seemed to him, from the nature of the spinous process in the negro, that such a condition as this would be absolutely impossible, because the works speak of the deformity, knob-like and not bifid condition, of the lower part of the cervical region and the upper part of the thoracic region, although the knob of the spinous process in the thoracic region has been or is being seen not bifid. In these cases they might have been in a bifid condition. Dr. Wilson did not mention clearly in his paper that he saw any bifid condition of the spinous process.

The other point mentioned by Dr. Wilson is that it might have been a rhomboid muscle. This bone may be an hypertrophy of the lateral bony projections on the seventh cervical vertebra.

DR. WILSON said that the removed bone in each case appeared to be attached to the vertebral column as a spinous process is normally attached and then deflected to the left, and articulating with the scapula. It resembled a large spinous process and seemed to take the place of the seventh cervical vertebra.

DR. DE FOREST WILLARD said that on examination of the bones removed the one from the smaller child has apparently not been cut away from the spinous process of the vertebra, but there is a true articulation. If this was an elongated spinous process there would be no such articulation. Dr. Wilson says there was not an articulation or joint at the scapular extremity. In the second case there also seems to be no articulation with the spinous process of the vertebra, and it bears evidence of having been cut away from the spinous process. Certainly the theory of a supernumerary rib would not be carried out.

DR. H. AUGUSTUS WILSON said that with reference to Dr. Hewson's remarks about a bifid specimen, in describing the smaller specimen, attention was called to its having two distinct tuberosities at the vertebra, and in the smaller specimen Dr. Rugh found distinctly a separate articulation, not alone with the scapula, but as well with the vertebra. In the larger specimen Dr. Wilson found a distinct articulation with the scapula, and evidence of there having been previously a fibrous or distinct articulation with the spinal column.

With reference to Dr. Hewson's question as to muscles, it was difficult to definitely determine the exact anatomical positions and relations of muscles, as it was recognized that the presence of this supernumerary bone must alter any such relations.

THE USE OF FIXATION PLATES IN THE TREATMENT OF FRACTURES OF THE LEG.

DR. LEWIS W. STEINBACH read a paper with the above title, for which see page 436.

DR. DE FOREST WILLARD said that the application of the plate in place of wire certainly stiffens the bone and holds it in better position. It is, however, only in selected cases in which the application of the plate can be intended, in comminution or in cases where there is great displacement. Surgeons are realizing more and more the necessity for fixation of the fragments, rather than trusting them to the uncertainties of the callus, which may or may not be properly encircling the bone in such manner as to secure good union. He had seen in the last three years many cases of non-union and mal-union which illustrated the necessity of absolute fixation. Great security and comfort is obtained by the use of a fixed gypsum dressing that will keep the fragments in thorough position. The old fracture box allows a certain amount of motion and is very likely to be followed by poor results or great overlapping. With the help of the Röntgen

rays, for definitely outlining displacement, and when it is impossible to bring the bones into good position, some operative treatment, some form of positive fixation should certainly be tried, and if aseptically performed, suppuration is rarely present and recovery is greatly facilitated. Not only do we gain in time, but we also gain in ultimate strength of bone. A large amount of callus interferes seriously with the circulation of the parts, and we have stiffening from adhesions of the tendons. Nerve-pressure frequently causes suffering and interferes seriously with the use of the member. This question of nerve-pressure and its ultimate results is a consideration which we should always take into consideration in the treatment of fracture.

DR. GWILYM G. DAVIS said that in fractures of the leg, personally he was very loth to undertake operative measures. Take, for instance, in simple fractures, in which there is marked deformity, such as overlapping, as shown in one of the skiagraphs. The fracture almost always runs obliquely from below upwards and backwards, and the upper fragment is pushed forwards. That is almost the constant deformity, and it is increased by the tendo Achillis. Of course, the muscles which bridge the part naturally tend to increase the overlapping, so that whenever there is this troublesome deformity, the first thing to try is to put the leg in the Pott's position, which is bending the leg at right angles to the thigh and laying it on its outer surface, that is, relaxing the tendo Achillis. In some cases the fracture can be gotten into good position by that process. Should that fail, next try extension and counter-extension by means of a long fracture box going somewhat above the knee. Apply adhesive plaster extension from near the site of the fracture down and from a short distance above the site of the fracture up, fastening the upper adhesive strips to the top of the box. The foot is placed away from the foot-piece and two to six pounds are placed on the lower extension, that will oftentimes bring down another proportion of these cases. Should these two means fail, then resort to the third, which is division of the tendo Achillis. By a combination of these means, he had been able to get the most of his fractures into a satisfactory position. When it comes to compound fractures, even there he would not advocate so radical measures as have been advocated by many surgeons. Almost all of the compound fractures which he had seen had been treated conservatively. There is always a small percentage of operative cases. Anybody who sees any number of these fractures will occasionally come across one in which the wound is so extensive that there is some, but comparatively little, cutting to be done, in order to obtain control

of the fragments and institute such treatment as desired; but when we come to fractures with comparatively small openings,—openings from a quarter of an inch to an inch in length,—I think the Treves method of covering the opening with powdered iodoform and placing the limb in a fracture box is such an extremely successful and satisfactory one that he hesitates to resort to operative measures. If, however, operative measures were needed, then he would be inclined to use some method similar to that of Dr. Steinbach.

DR. J. T. RUGH described a case which came under his observation about a year and a half ago. A man had previously had the operation, described by Dr. Steinbach, done for an ununited fracture of the tibia. Suppuration followed and continued profuse until he came to the hospital. Being a laboring man and without means, he had become so discouraged over the loss of his time and means of living that he would consent to nothing but amputation. The surgeon strongly urged an attempt to save the leg, but as the man was determined upon amputation, the leg was amputated. It was his privilege to examine the specimen, and he found the silver plate blackened and lying loose upon the anterior surface of the tibia. The screws were corroded by the action of the pus and secretions of the wound. The ends of the tibia, which had been in apposition at the time of operation, were eroded and softened, so that a space of an inch or more existed between them. There were no spiculæ or sequestra present.

Another case of interest in connection with this subject was one of non-union of the tibia following an osteotomy of both bones for an acute bow in the leg about five inches above the ankle-joint. The leg was opened in front, a section of bone removed from the fibula, the edges of the tibia freshened, and both bones secured by wire sutures. Suppuration ensued and in three months the wires were removed. The leg has been constantly kept in a plaster-of-Paris dressing and the wound has been dressed every other day. There is now firm union; but one or two small sinuses still persist. The boy is walking on the leg and will have a perfectly useful and straight member in spite of the unfavorable progress.

DR. ADDINELL HEWSON said that no allusion had been made to the adjustable screws of Clayton Parkhill. It seemed to him in cases where there is likely to be suppuration, the screws as advocated by Dr. Parkhill would come in very well, because they allow the proper amount of drainage to take place. He had recently had some experience with these,—not in the line of the cases presented by Dr.

Steinbach, but in cases of fracture of the femur. Since then, however, the apparatus has been very much improved, so that now, instead of using that apparatus as it was then presented,—the nickelled steel,—now they give us a nickelled silver. Wessel's silver is the trade name for it. It is entirely a solid metal and non-corrosive. It seemed to him that in some cases which are bound to result in suppuration, the application of the Parkhill screws, where the plate is entirely outside and the screws themselves act as drains for the pus that may be present, would act very well.

DR. JOHN B. ROBERTS called attention to the use of the Röntgen ray for the purpose of diagnosis. While we may gain a great deal by using the Röntgen method, there is a possibility that it may lead some at least, if not all, into mistakes. He saw quite recently a case of ununited fracture of the radius, which was probably indirectly caused by a reliance on the skiagraphic picture. He thoroughly agreed with Dr. Steinbach that a considerable number of fractures should be cut down upon and examined. We make mistakes at times in not exploring fractures. He would be inclined to resort to the plate in ununited fractures to get perfect position and steadiness after resection of the ununited fracture. He would be rather inclined for the ordinary fracture, if it did not keep in good position, to cut the tendo Achillis, as Dr. Davis has suggested, or to apply extension, and to reserve the plate for ununited fractures which need resection. Closed fractures, or those not accompanied by a wound, which do not give good position under ordinary manipulations, he would be inclined to nail together by some form of nails, box nails or a form of nail devised for that purpose.

DR. HENRY R. WHARTON said that he believed in the primary fixation of the fragments in many compound fractures. He had practised this method in many cases and had had satisfactory results. He had not had very great trouble with the removal of the means of fixation, whether it be heavy silver wire, which is used in certain cases, or whether it be the silver plate fastened by means of screws. In some cases he had had wounds undergo aseptic healing and had had no trouble with the plate afterwards. But in a great many cases the removal of the wire or plate will be indicated in a few months, even if there has been no suppuration immediately after the application. Sometimes it causes irritation and a slight amount of suppuration may develop.

In certain simple fractures exploratory incision and fixation are indicated. Occasionally one comes across a deformity that he has

trouble in correcting and it is necessary to resort to operation and some method of primary fixation. In a case under his observation of a simple fracture of the internal malleolus, a fracture of the lower portion of the fibula, the deformity of the fibula was so great and so persistent that he finally had to cut down on the fibula and wire the fragments together. In this case he had perfect healing of the wound; and up to the present time the wire has caused no irritation.

DR. STEINBACH said that he was not inclined to make an operative case of one that could be treated by simpler means; the four cases quoted in his paper were illustrative of those which require a plate or other equally radical measures, and the results obtained not only justify the measure adopted but speak in favor of the plate.

REVIEWS OF BOOKS.

THE INTERNATIONAL TEXT-BOOK OF SURGERY by American and English Authors. Edited by J. COLLINS WARREN, M.D., LL.D., and A. PEARCE GOULD, M.S., F.R.C.S. Volume I. General and Operative Surgery. Philadelphia: W. B. Saunders, 1899.

This work affords excellent illustration of the changes wrought in instruction by the discoveries of laboratory workers during the past twenty-five years. In the early seventies the suspicion began to grow that dust had something to do with disease, particularly suppurative conditions in wounds. It took, however, all the years of that decade to hunt down the causes of wound infection, and to prove beyond a doubt its bacterial source. In all the works on surgery published during these years of research, but little stress is therefore laid upon what may be termed the natural history of infections. Some authors refer in a timid way to the possibility of germ life bearing a causal relation to these surgical diseases. Others omit all mention of the subject. Not one bases the treatment on the cause. So as we turn the pages of these ancient works, for it is not so much lapse of time as lapse of events which make a book ancient to-day, we find in the chapters on diseases of bones and joints such expressions as scrofula, the strumous diathesis, white swellings. In the chapters on inflammation, we are entertained with discussions of the origin of pus. Erichsen in 1872 says, "Commonly, mechanical injuries are those that occasion surgical inflammation." He fails to mention the part that micro-organisms play in the resulting infection. The chapters on scrofula and tubercle abound in the description of the microscopic appearances of the parts, and frequent mention is made of the giant cell. In fact, what we now recognize as the barrier which nature attempts to throw around the invading bacteria (Metsch-

nikoff) was then described as an essential element of the disease. So to-day pathologists talk in a learned way which leads not whither, of the epithelial cell and the connective tissue cell, and cellular rests and foetal survivals. Some day a second Koch will arise and show us that these are the results of irritation and not the cause. Let no one, however, gird at the pathologist, for to his labors are we indebted for all that is progressive and hopeful in medicine and surgery.

The work before us commences with a brief but excellent treatise on bacteriology. Thus the student of to-day starts at the point where his fathers in the profession finished. He sees clearly where his predecessors saw not at all or through a glass darkly. He knows that pus is never laudable, that scrofula means tuberculosis; and suppuration, infection. The first lesson that he must be taught, therefore, is one which will make him familiar with the various agents of infection. Dr. Ernst has succeeded in compressing this knowledge in a few pages, from which a surgeon of older date, to whom laboratory instruction is denied, may get a sufficient and fair working knowledge of the subject. The very excellent plates which illustrate the microscopic appearance of the stained organisms give a faithful representation of what is actually seen in the field of the microscope. There is little to criticise in this article. Under the head of tetanus is a suggestion which may explain those cases of tetanus which develop in wounds that are apparently open. These wounds are in the experience of the reviewer always the seat of a mixed infection, and the explanation given that the oxygen is entirely consumed by the aërobic bacteria would account for the development of the anaërobic organism in conditions which would otherwise preclude its growth. The writer's remarks on the bacillus pyocyaneus are hardly in accord with recent literature respecting the pathogenic properties of this organism. Most writers on bacteriology, when treating of this bacillus, have perhaps followed Schimmelbusch, who in an article published in 1893 denied its pathogenicity. Since then so many instances have been published in which it was the undoubted agent of infection, that it seems hardly fair to dismiss it as non-pathogenic. For those who care to look the matter up, Lartigau's article on the subject is com-

mended, published in *The Journal of Experimental Medicine*, Vol. iii, 1898, p. 595. The reviewer in 1898 isolated the organism in pure culture in two cases of rapidly spreading gangrene, one case being the result of an infection of the middle finger by the spine of a fish; the other occurring in a laparotomy wound. It is undoubtedly true that such cases are uncommon, nevertheless they have accumulated in numbers sufficient to justify us in speaking of this organism as not infrequently pathogenic.

The chapters on inflammation, infection, and suppuration are admirable expositions. The different topics are treated in a manner to be expected of the scholarly editor. We are a little surprised, however, at the frequency with which the reader is advised to use "antiseptic poultices" in suppurative conditions. We cannot imagine what antiseptic can be added to any form of poultice that can redeem it from its pristine nastiness. It has been shown again and again that antiseptics which are capable of destroying pathogenic organisms also occasion cellular death and merely increase the general destruction. To join an antiseptic and a poultice is to violate the Rabbinical precept, "Though shalt not plough with an ox and an ass together." The statement that fistulæ-in-ano are usually tubercular is equivalent to saying that ischio-rectal abscesses are usually tubercular, a proposition which is scarcely tenable.

The chapter on the surgical pathology of the blood is another of those signs of the times of which this volume is full. The surgeon who puts its precepts into practice, will have fewer errors both of omission and commission of which to repent. If the general practitioner will also follow its teachings, we shall have fewer cases of suppuration treated as intermittent fever or rheumatism. A systematic blood analysis before operation would result in averting many a surgical defeat, for it is also true in surgery that he who fights and runs away may live to fight another day, likewise his patient. The chapter on wounds is a thorough and scholarly treatise on the subject, and for a volume on general surgery is exhaustive. It shows an extensive acquaintance with the literature and the facts both of pathology and treatment are marshalled in a logical sequence which

adds emphasis to the teaching. The space allotted to this review does not admit of more than a cursory mention of this and other excellent chapters, and it is with regret that the reviewer is compelled to omit mention, particularly where mention must mean praise. The chapter on the technique of aseptic surgery is important, and comprises within its pages an account of all the resources which science calls to our aid to-day in the production of an aseptic wound. The recommendation that the surgeon use sea sponges, comes from one who has much confidence in the ability of his nurses to render aseptic an animal substance by complicated processes and an equal confidence in the exchequer of the hospital. The use of gauze for sponges does not require so elaborate a cleansing process, and will certainly endear the surgeon who uses it to the guardian of the funds. Absorbent cotton placed in the middle of the gauze sponge diminishes its absorbability and makes it clumsy. Under the head of sterilization of dressings fractional sterilization is recommended. As this method depends on the assumption that spores undestroyed at the previous sterilizations will develop into the more vulnerable form, one cannot see the value of the method when applied to dry dressing, for spores do not develop into the rod forms nor arthrospores into cocci except in the presence of a nutrient medium.

The chapter on fractures is the fullest that has appeared on this subject in a work of this size. The writer who has brought to the subject a long and ripe experience, has not disappointed those who remember his classical study of fractures of the lower extremity of the radius. Excellent use has been made of the discovery of Röntgen to illustrate the changes in structure and function which occur as a result of fracture. An excellent account of the ambulant method of treating fractures of the lower extremity closes the chapter. The author of the chapter on dislocations has not neglected to make use of the recent monograph of Allis, on the subject of dislocations of the hip, a monograph which is a credit to American surgery. The chapter on tumors is by Bland Sutton, whose work on this subject is familiar to all. It is with regret that the reviewer is compelled to lay aside this volume. It is the most valuable work on the subject that

has appeared in some years. The clinician and the pathologist have joined hands in its production, and the result must be a satisfaction to the editors as it is a gratification to the conscientious reader.

ALGERNON THOMAS BRISTOW.

A MANUAL OF SURGICAL TREATMENT. By W. WATSON CHEYNE, M.B., F.R.C.S., F.R.S., Professor of Surgery in King's College, London; Surgeon to King's College Hospital, etc.; and F. F. BURGHARD, M.D. and M.S. (Lond.), F.R.C.S., Teacher of Practical Surgery in King's College, London; Surgeon to King's College Hospital, etc. In six imperial octavo volumes, with illustrations. Vols. I and II. Philadelphia and New York: Lea Brothers & Co., 1899.

The author's purpose is expressed in the preface, as follows: "We have ourselves frequently experienced the want of detailed information, especially as regards the after-treatment of our cases, and have had to learn the best methods of procedure from experience. Nothing can of course replace experience, but it is often of the greatest advantage to have a detailed record of that of others upon which to base one's work. It is this want that the present work is intended to supply. We have tried to put ourselves in the place of those who have to treat a given case for the first time, and we have endeavored to supply them with details as to treatment from the commencement to the termination of the illness. We have assumed that the reader is familiar with the nature and diagnosis of the disease, and we only refer to the pathology and symptoms in so far as it is necessary to render intelligible the principles on which the treatment is based, and the various stages of the disease to which each particular method is applicable.

"We have purposely avoided attempting to give anything like a complete summary of the various methods of treatment that have from time to time been proposed; to do so would merely confuse the reader. Only those plans are described which our experience has led us to believe are the best, but with regard to these we have en-

deavored to state exactly and in detail what we ourselves should do under given circumstances. In some cases no doubt several methods of treatment are of equal value, and while we have only discussed at length that which we have ourselves been led to adopt, we have referred shortly to the others."

Volume I. The first four chapters treat of inflammation, both acute and chronic, acute suppuration, ulceration, and gangrene. The usual routine treatment is described. The description of nearly obsolete methods,—blood-letting, various kinds of cauteries,—fills more pages than it deserves lines. The chapter on gangrene would be very good if it did not fail to give the question of amputation in diabetes the detailed consideration due to the importance of the subject.

The chapter on anæsthetics is elaborate, and gives rules for the choice of anæsthetics, according to age, condition of the patient, and nature of the operation. These rules can hardly find general acceptance. "Under three years of age . . . chloroform all through." "From three to twelve A. C. E. all through." "Rectal and genito-urinary operations . . . always ether if possible." A number of clumsy devices for giving ether with somebody's name attached are shown, but there is no description of the proper method of making the practical towel and newspaper cone which should be known to everyone who ever gives an anæsthetic.

Chapter VIII. Wounds—the treatment of incised wounds—is so very bad as to condemn the whole volume. There is no excuse to-day for recommending clumsy, unreliable methods, when surgeons the world over are nearly a unit in using a simple, reliable, logical method, the so-called aseptic method.

Bichloride solution after proper washing is the only method recommended for preparing the hands, the most important factor in operative work. Such methods as the permanganate of potash, the generation on the hands of nascent chlorine, or the use of rubber gloves are wholly ignored.

Disinfection of instruments. "After an operation they are thoroughly washed . . . immersed in a 1 : 20 carbolic acid solution, dried, and put into a press where they can be kept free from dust. If

they have been used for a septic case, they should be boiled before being put away. . . . If this be done there is not much disinfection required immediately before use, and it will suffice in the majority of cases to immerse the instruments in a 1 : 20 carbolic acid solution for half an hour or longer before the commencement of the operation. . . .

“*Boiling* instruments is doubtless a very certain method of disinfecting them, and is to be strongly recommended where it can be carried out, and where the instruments are all metal.”

The above may seem to represent pretty elementary ideas, but worse is to come. In the paragraph on “Preparation of Ligatures,” the authors exhibit a degree of rashness or of ignorance that makes it a cause of regret that this work may possibly be consulted by those deficient in proper discrimination :

“Preparation of Ligatures. The disinfection of the catgut, silver wire, or other materials used for ligatures or stitches may be effected by immersion in carbolic acid. It may be taken as certain that immersion in a 1 : 20 watery carbolic solution for from twenty-four to forty-eight hours will destroy any organisms to which the fluid has free access. . . . Some surgeons boil their silk before the operation, but while there is no objection to this procedure it is unnecessary. As it is impossible to treat catgut in this manner (it would be spoiled by boiling), the method would involve treating the silk in one way and the catgut in another.”

“Impossible to treat catgut in this manner” does not appeal to one who for years has used excellent catgut sterilized by boiling in cumol at a temperature of 165° C.

Perhaps enough has been quoted to show what kind of teachings may still emanate to-day from men of eminence ; but the subject is of such very great importance that attention is called to the

“Preparation of sponges . . . After an operation the sponges are thoroughly washed . . . and are then placed in a vessel containing a 1 : 20 carbolic solution.” The authors do not use the sterile gauze pads commonly employed in most civilized countries ; they occasionally make use of swabs of cotton “where the use of

swabs is advisable . . . foul septic wounds." The nurses must have a peculiar training. "The nurse should of course disinfect her hands, but as she is constantly soiling them, she should not be allowed to wring out the sponges."

The authors' idea of a good surgical dressing, "The most universally applicable and most satisfactory dressing yet introduced is the latest dressing proposed by Lord Lister, viz., gauze impregnated with the double cyanide of mercury and zinc."

If amusement only is sought, the reader may be referred to the authors' criticism of the method which they describe as "treatment without antiseptics."

There is an excellent chapter on syphilis, just about sufficiently detailed to be of value in a quiz compend.

Volume II begins with seven chapters on deformities, such as flat- and club-foot, knock-knee, bow-legs, congenital dislocation of the hip.

Division II. Chapters VIII to X treat of the surgical affections of the skin, subcutaneous tissues, and nails. Malignant growths of the skin are described as "cancerous tumors," and "these may occur under three forms, namely, sarcoma, rodent ulcer, and epithelioma." Two pages only are devoted to these "cancerous tumors"—a pretty scant allowance in a six-volume book for so important a topic.

Chapters XI to XVII contain the treatment of affections of the lymphatic system, fasciæ, bursæ, muscles, tendons, and tendon-sheaths, and are thoroughly satisfactory.

Chapter XVIII, the affections of the nerves, is admirable. The remainder of the work treats of the surgery of the vascular system. The subject is well handled, but the anatomical illustrations are useless.

The work, on the whole, has a foundation of scientific knowledge and a soundness of views that entitle it to respect. Written in an atmosphere of veneration for illustrious precedents, it does not represent the real activity or progress in surgery that exist to-day. The second volume is much more attractive than the first; it could not well be otherwise.

CHARLES L. GIBSON.

A MANUAL OF MODERN SURGERY. An exposition of the accepted doctrines and approved operative procedures of the present time. By JOHN B. ROBERTS, A.M., M.D., Professor of Anatomy and Surgery in the Philadelphia Polyclinic. Second edition, revised and enlarged. Illustrated with 473 engravings and eight plates in colors. Pp. 842. Philadelphia and New York: Lea Brothers & Co.

This is a very practical work in which the essential features of every subject are treated in a simple, direct, and concise manner. The brevity of language is occasionally so marked that little description of a method is given beyond the statement of its being.

In general the views are sound, and the subject is dealt with in accordance with the title "Modern Surgery." It is much more "up to date" than it is ordinarily possible to make a book in these days of rapid advances of the surgical art. There are occasional lapses, such as the description of bone plates, while Maunsell's valuable method of intestinal reunion is omitted. Witzel's and Frank's methods of gastrostomy appear, while Maunsell's and Kader's more recent and far better operations are not mentioned. The fracture box also comes to light again; it may, however, appeal as a "new" method to graduates of recent years. Still such rare lapses into what was modern surgery only a very few years ago, do not detract from the value of the book which is to be recommended to those in need of a concise and recent treatise on surgery. The book is well illustrated.

CHARLES L. GIBSON.

TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION. Vol. XVII. Edited by DE FOREST WILLARD, A.M., M.D., PH.D. 1899.

This is the report of the meeting held at Chicago during the presidency of Dr. William W. Keen, and represents a high class of scientific work, of editorial supervision, and of book-making. The president's address was upon the technique of total laryngectomy. Dr. Nicholas Senn read a paper on the first-aid package in military

surgery. "Observations upon the Organization and Equipment of Military Field Hospitals in the Volunteer Army" was the title of a paper read by Dr. G. R. Fowler, and based upon the author's experience as division surgeon and consulting surgeon of the Seventh Army Corps.

Dr. Charles B. Nancrede presented his observations on the effects of modern small-arm projectiles as shown by the wounded of the Fifth Army Corps during the campaign resulting in the capture of Santiago de Cuba. He says that "the greatest advance in military surgery on the battle-field in recent times is the 'first-aid packet,' and the greatest boon conferred on the wounded soldier has been asepsis and antisepsis, because, in the majority of instances, rendering his injuries so painless and their complication so slight that even anæsthetics no longer occupy the chief place as a blessing to the wounded, because comparatively rarely needed." The same author also says, "All perforating ball-wounds of the abdomen operated upon, I am informed, perished, while a number I saw recovered without intervention, antiseptic occlusion being relied upon. The Spanish surgeons reported similar results after undoubted intestinal perforations." These two papers on military surgery were followed by an interesting discussion, which might with profit to the army find its way to Washington.

Dr. Maurice H. Richardson, in his paper on appendicitis, asks the questions, "Should every case be operated upon as soon as the diagnosis of appendicitis is made?" and "Should the appendix be removed in every case?" This paper brings our present knowledge of this subject up to date. The discussion following its reading was animated.

A paper by Dr. Theodore Kocher on some conditions of healing by first intention, with special reference to disinfection of hands, adds especial value to this volume of Transactions.

Dr. Joseph Ransohoff has a paper on nephrotomy and nephrectomy. In a paper on hernia following operations for appendicitis, Dr. Francis R. Harrington reports the statistics based upon 503 cases of appendicitis operated upon at the Massachusetts General

Hospital during ten years. The paper by Dr. A. Vander Veer on unusual cases of appendicitis and complications presents the anomalies of this disease.

The other papers in this volume maintain the general high standard of work done by this Association. Under the editorship of Dr. De Forest Willard, the "Transactions of the American Surgical Association" continue to be the best edited volume of society transactions that comes into our hands.

JAMES P. WARBASSE.

TRANSACTIONS OF THE AMERICAN ORTHOPÆDIC ASSOCIATION. Vol.
XII. 1899.

This volume represents the proceedings of this Association at the meeting held in New York in 1899. The presidential address, delivered by Dr. W. R. Townsend, traces the development of New York hospitals from the New Amsterdam Hospital, opened by the Dutch West India Company in 1658, down to the present day. The autobiographical reminiscences of Dr. Charles Fayette Taylor, in which he describes the invention and introduction into use of his splint for spinal caries, are of extreme interest.

The correction of lateral curvature, congenital deformities of the spine, osteo-arthritis of the spine or spondylitis deformans, observations on the treatment of congenital dislocations of the hip, position symptoms in joint-diseases, palsy of the interossei muscles in talipes arcuatus, the State care of indigent crippled children, rheumatoid arthritis, are some of the most important subjects treated in the fifty papers published in this volume of Transactions.

Biographical sketches of Dr. A. B. Judson, Dr. W. J. Little, and Dr. William Detmold, the fathers of subcutaneous tenotomy, are presented. The volume is a credit to the Association. It is well edited and printed.

JAMES P. WARBASSE.

CORRESPONDENCE.

GASTRO-ENTEROSTOMY BY THE PODREZ METHOD.

ON page 759 of the ANNALS OF SURGERY, December, 1899, there is an article headed "Gastro-enterostomy by the Podrez Method."

If the reader will turn to the *Journal of the American Medical Association* of May 16, 1891, he will find a paper by myself, entitled "The Use of the Elastic Ligature in the Surgery of the Intestines," and if he will read it carefully he will see that I had anticipated Podrez by more than seven years.

Questions of priority may not be of much interest to the profession, and yet it seems to me right to insist upon my rights in this case.

THEO. A. MCGRAW.

DETROIT, MICH , January 3, 1900.

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TWO CASES OF OESOPHAGEAL DIVERTICULUM, WITH REMARKS.

BY MAURICE H. RICHARDSON, M.D.,

OF BOSTON, MASS.,

SURGEON TO THE MASSACHUSETTS GENERAL HOSPITAL.

CASE I.—I first saw H. M. H., Esq., a gentleman of fifty-three, on November 24, 1893, in consultation with Dr. F. I. Knight. He had been referred to us by Dr. E. F. Cushing, of Cleveland, Ohio. Mr. H. had suffered from malaria and digestive disturbances since service in the United States navy during the Civil War. The family and personal history were good. In June, 1890, he had some pharyngeal trouble accompanied by "hemming" and clearing of the throat. For some six or eight months he had some difficulty in swallowing solids. Dr. Knight found at this time that the pharynx was brown and cicatrized. There was little, if any, resistance to the passage of a bougie of considerable size. Dr. Knight thought that the symptoms might be owing to the condition of the lower pharynx. About a year after this time Dr. Bosworth discovered an oesophageal pouch.

Dr. Cushing, in a letter to Dr. Knight in 1893, wrote: "Mr. H. has an oesophageal diverticulum of uncertain age. It has caused symptoms for about four years. About three years ago Dr. Bosworth discovered its existence, and since then Mr. H. has been under my observation. It is in the left side of the neck, with its orifice at about the level of the cricoid cartilage. It fills with the first food swallowed at a meal, but the distended pouch does not further interfere with deglutition. The pouch can be partly emptied by a voluntary muscular effort soon after eating. It can then be swabbed clean by the patient with a cotton-tipped bougie. In the past three years the diverticulum has increased in depth about one-half, and perhaps doubled its capacity. It will now hold about one ounce. I have advised, whenever the question of operation comes up, that it should be discussed by you and Dr. Richardson. For the past six months there has been no treat-

ment except to keep the pouch clean. Before that time a large-sized bougie was passed, in the hope of obliterating the sac, but without effect. Of late it has been impossible to get any bougie past the sac. The history of progressive interference with deglutition makes me think that the question of operation ought to be thoroughly discussed."

Mr. H. himself stated that there had never been any injury to the throat. "The first raw oyster will lodge in the sac; the second will go down. The difficulty in passing the bougie is that it will go right into the sac. Dr. Cushing used to pass the bougie himself. After a week or two I learned to pass it; but for some reason I stopped it, and did not use the bougie for some little time. When I attempted to use it again, I could not pass it. There is no pain except when I try to pass the bougie. There has been some loss of flesh, but not very much,—perhaps ten pounds."

The general condition of the patient was excellent. In passing the olive-tipped probang an obstruction was met nine and one-quarter inches from the upper incisors. I could not make out exactly the opening into the cesophagus, but thought it to be at the junction of the cesophagus with the pharynx, and a little to the left. The fundus of the sac would be, in a man of the patient's height, a little below the level of the clavicle. No tumor could be felt, even when the sac was distended with food. The olive-tipped probang could be felt as it was passed up and down. When at the bottom of the pouch, the olive tip could not be felt; and while passing there was no way of telling whether it was in the cesophagus or in the pouch.

The patient stated that he had learned the art of swallowing without choking; and yet, at times, in spite of every care, he had been obliged suddenly to leave the table on account of violent choking sensations. In swallowing liquids, he would at first take a single small mouthful; after that he could swallow anything. If he tried to take several mouthfuls first, he would choke,—the obstruction probably interfering with the cesophageal muscles.

After a careful consideration of the case, it was decided that an operation for the removal of the diverticulum ought, in the near future, to be performed. My opinion was embodied in a letter to Dr. Cushing, dated December 12, 1893, as follows:

"This lesion does not as yet seem to cause him serious inconvenience or disability. At least, he says that, if it is not

going to be any worse, he can get along very well. The tendency of these œsophageal diverticula is, of course, to get worse, and, owing to decomposing food or some other cause, to set up serious trouble. I see no reason why an external œsophagotomy should not be performed and the diverticulum removed. I should try—if at the close of the operation there seems to be no objection—the immediate suture of the œsophagus. The external wound ought, I think, to be loosely packed with gauze for a day or two before it is allowed to close. I dare say that the time will come when we shall close the œsophagus and the neck immediately after these operations; but there is so much danger of infecting the wound when the œsophagus is opened, that I should not think this a safe procedure at present."

I did not see Mr. H. again until May 26, 1898. In the mean time he had consulted many prominent surgeons abroad. He was advised by Butlin to have the diverticulum removed. Butlin refers to his case in the *British Medical Journal*, 1898, Vol. i, page 8, as follows:

"CASE VI.—A gentleman aged fifty-seven, staying in London, was brought to me by his doctor, Dr. Edward F. Cushing (Cleveland, Ohio), for my opinion on the desirability of removing a pressure pouch from his œsophagus on July 15, 1897. In the year 1891 he began to experience annoyance from the return of fragments of food from time to time. The difficulty has slowly grown greater, but he had not become thinner, and his health was excellent. He was able to demonstrate a pouch in the usual place with ease; for he was a very intelligent man, and had studied the whole subject of œsophageal pouches with great attention. He could press water, which he had just swallowed, out of the pouch, or, rather, empty it out by leaning forward; could pass an instrument into the pouch (a distance of about nine inches from the teeth) and press solid materials out of the same. But there was no obvious bulging of the neck after swallowing.

"I believe this gentleman has made up his mind to have the pouch removed, if he has not already undergone the operation."

I saw Mr. H. for the second time on May 26, 1898, as I have said before. Since 1893 the symptoms had remained, on the whole, the same. There had been some increase in the dysphagia, and choking at table had been more troublesome, so that he had been obliged to avoid public dining-rooms and to give up social

dimers. He had become very skilful in keeping the pouch dry and clean. His general health had not suffered seriously.

I was able to pass the probang into the pouch without difficulty; in fact, it was impossible to get by it. No evidence as to the breadth of the diverticulum could be obtained by physical examination. No tumor could be felt, whether the pouch was empty or full. There was no way of telling whether it was situated more to one side of the median line than to the other. The path taken by the probang was precisely that of the normal œsophagus.

The history and physical signs clearly warranted the diagnosis of pulsion diverticulum.

It was probable, from the absence of local inflammation, that the pouch was non-adherent, and that, like the œsophagus itself, it would be found loosely connected with the deep structures of the neck and posterior mediastinum.

The dangers to be anticipated from excision were those of sepsis. Because of the impossibility of sterilizing the pouch, the patient could hardly escape a slight wound infection. He would run the danger, also, of those deep cervical phlegmons which are occasionally seen after external œsophagotomies for the removal of foreign bodies. Unlike cases of impacted foreign bodies, however, in many of which the pericœsophageal infections are at the time of intervention already under way, the present case presented no mucous abrasions, no infected areas. There was only the danger of wound infection at a time when there would be every opportunity for cleansing and for disinfection. The danger of infection was, moreover, slight, for the patient had kept the pouch clean by frequent wiping; there had been no putrefaction of retained food. The only source of wound contamination would be a normal œsophagus and a well-cleansed diverticulum.

As well as could be determined by similar cases, the course of this lesion, left to itself, would be progressive. As a result of the gradual dilatation of the pouch, the patient would suffer from a constantly increasing dysphagia. Moreover, there would always be the possibility of local phlegmons and general septicæmia. The dysphagia itself might become excessive, and require gastrostomy. Finally, with advancing years, the dangers from surgical intervention would be greatly augmented: for not only would the pouch be larger and in relation with deeper and more impor-

tant structures, but it might, by inflammation, become adherent to them. Moreover, to the increased difficulties of the operation would be added the dangers of enfeebled powers of resistance. An operation was therefore recommended.

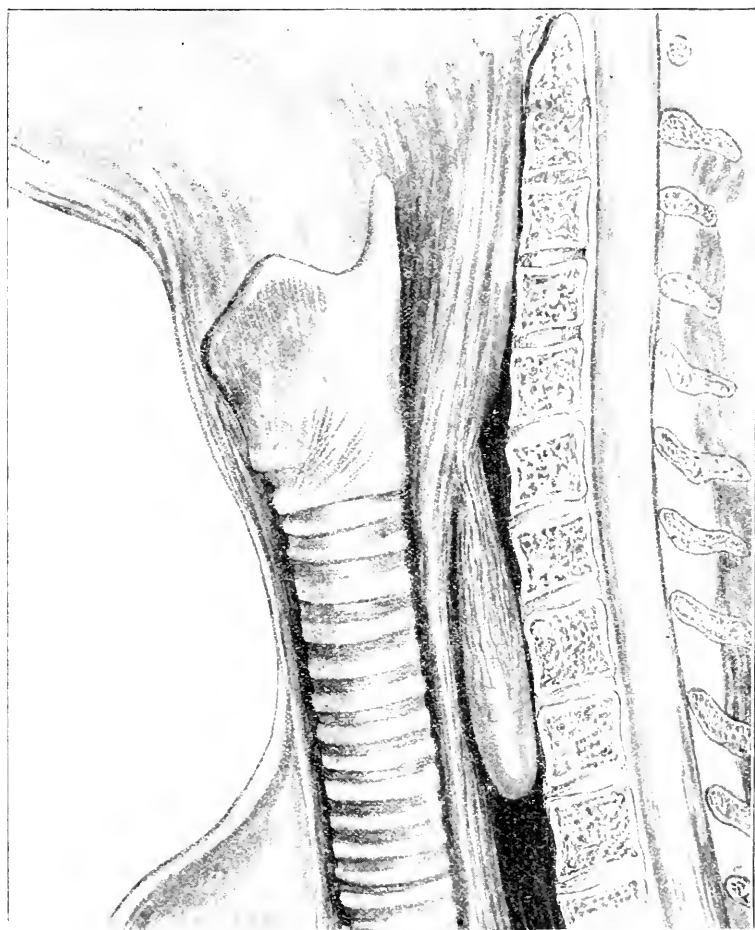


FIG. 1.—Situation, shape, length, and depth of the diverticulum when first exposed by dissection. Case I.

The operation was performed at St. Margaret's Hospital on June 1, 1898. I was assisted by Drs. Brewster and Jones and by Miss Durling. Ether was given by Dr. Cushing, of Cleveland.

Dr. Brewer, of New York, and Dr. J. C. Munro, of Boston, were present.

To keep the mouth and throat dry, by Dr. Cushing's suggestion atropia was given hypodermically before etherization. This plan worked admirably. The œsophagus was exposed by a cut about four inches in length along the anterior border of the sternocleido-mastoid. To get a clear view of the field, the anterior belly

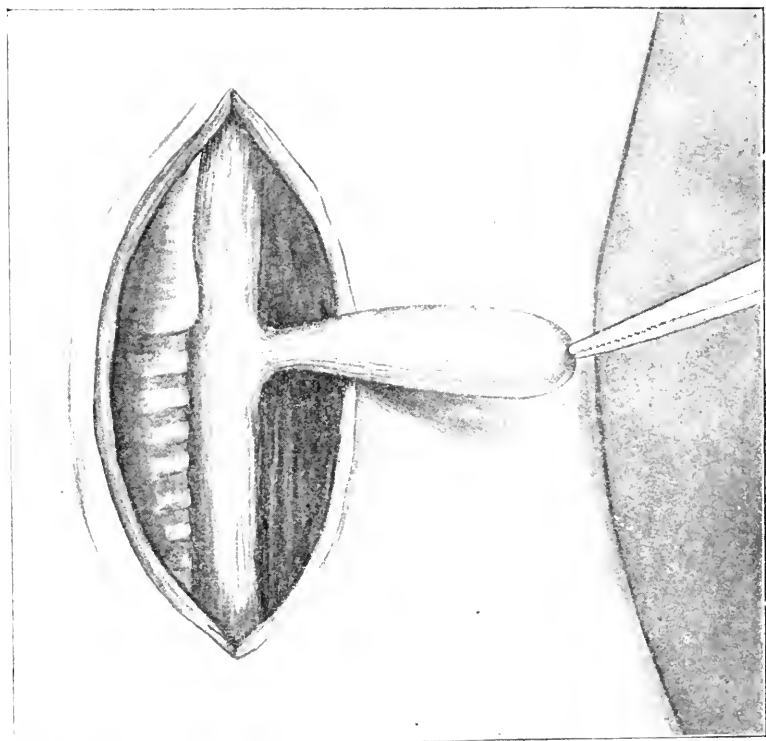


FIG. 2.—Diverticulum freed from its attachments and delivered from the wound.
Case I.

of the omohyoid was cut. Especial care was taken to avoid the recurrent laryngeal nerve and the thoracic duct. The great vessels at the base of the neck stood out prominently at the lower angle of the dissection, which was throughout so dry as not to require the application of a single ligature. At first no pouch could be detected. Careful exploration with the blunt dissector

between the œsophagus and the vertebrae, however, finally revealed it. It was situated behind the œsophagus, and extended downward nearly to the aortic arch (Fig. 1). The presenting surface was grasped with forceps and drawn to the left. The attachments of the pouch were, as anticipated, loose, and the sac, easily separated with blunt instruments, yielded to moderate trac-

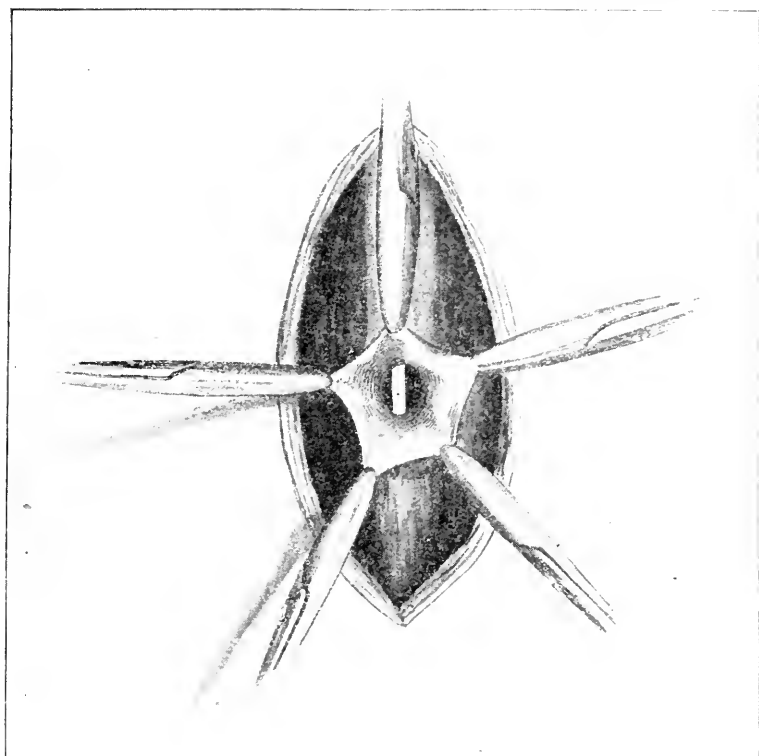


FIG. 3.—Isthmus of diverticulum after excision of its main portion. The cut margin is grasped by pressure-forceps. In the œsophageal opening the stem of the probang is visible. Case I.

tion, until the whole pouch was delivered and projected from the wound at right angles with the œsophagus, to which it remained attached by only its base (Fig. 2). Even at this time it was difficult to make out exactly the opening of the pouch and its relations with the œsophagus. Dr. Brewer therefore passed a probang into the pharynx, beyond which it was easy, with the finger

in the wound, to deflect it by the opening of the pouch. The fundus of the pouch was next opened, and the edges of the opening were grasped with hæmostatic forceps. By applying four or five forceps, and by spreading this opening (Fig. 3), we could determine the exact extent of the interior of the pouch, the size of its mouth, its relation to the pharynx and the œsophagus. The base of the pouch was at the beginning of the œsophagus, in its pos-

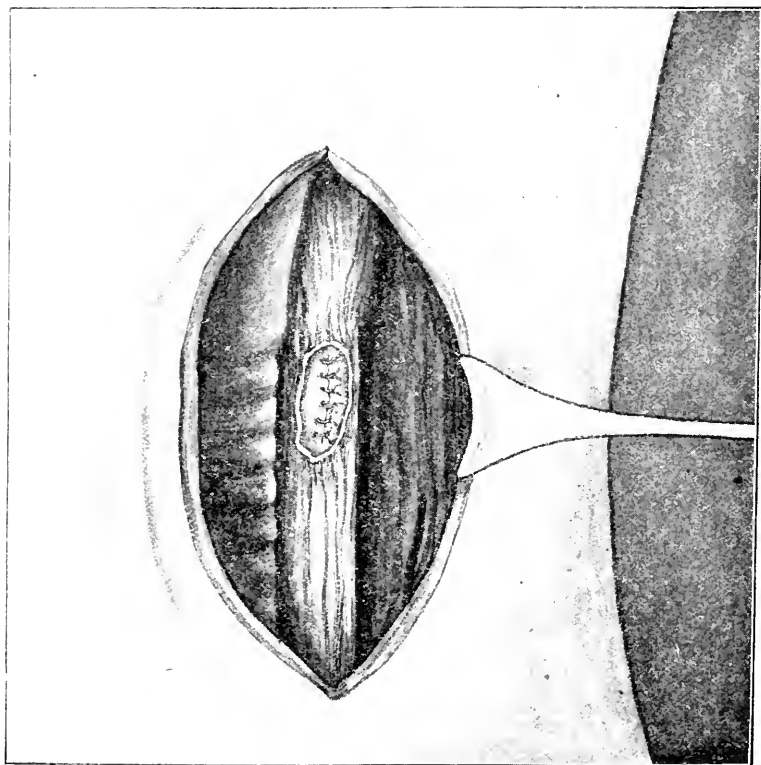


FIG. 4.—Shows the mucous lining of the base of the sac inverted and united by interrupted Lembert sutures of catgut. Case I.

terior wall. The upper margin of the opening was contiguous to the pharynx, if not actually between the fibres of the lower constrictor. The walls of the pouch were thick at the base. Towards the fundus they became gradually thinned. The pouch seemed to be a prolongation of the mucous membrane between and through the muscular fibres of the pharynx and the œsophagus.

At the fundus its walls were translucent,—almost transparent. The base was thickened and seemed to be grasped between longitudinal muscular fibres. These longitudinal fibres could be seen passing up and around the isthmus of the diverticulum, gradually being merged and lost in the translucent portion. About the constricted base, and continuous with the œsophagus, were numerous veins circularly arranged, from which were given off towards the

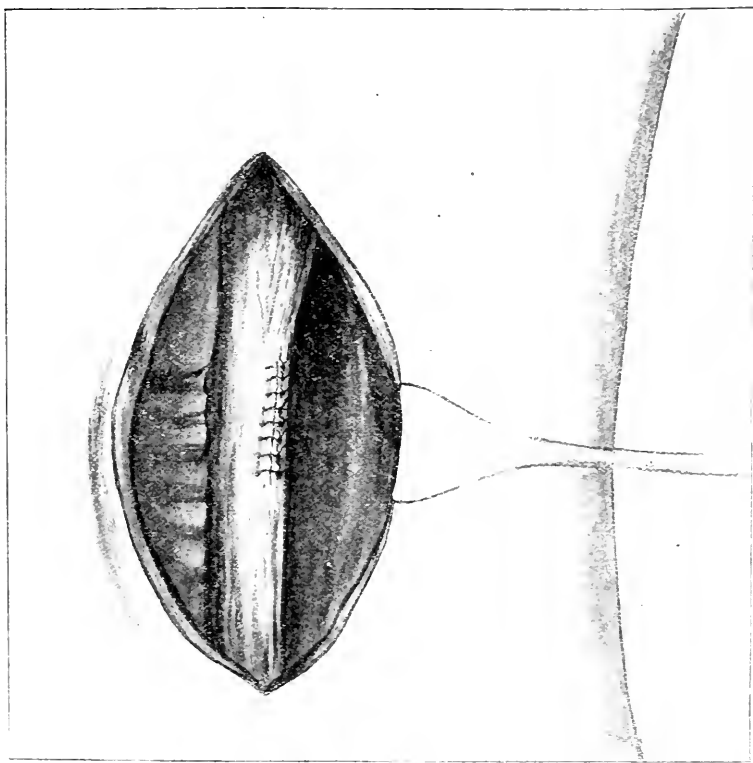


FIG. 5.—Shows the external layers of the œsophagus closed by interrupted Lembert sutures of silk. Case I.

diverticulum many small branches. The interior of the diverticulum was perfectly smooth. The tip of the index-finger could be thrust into the œsophagus through the circular base of the pouch, which was just about large enough to admit it. The pouch was removed by cutting through its isthmus close to the pharyngeal opening. The mucous membrane was inverted into

the cesophagus and fastened together by a few interrupted fine catgut sutures (Fig. 4). The other layers were also inverted and fastened by interrupted Lembert stitches of silk (Fig. 5). The external wound was closed, except at the centre, where a space was left through which a small piece of sterile gauze led to the line of sutures in the cesophagus.

The patient bore the operation extremely well. The temperature was practically normal after the operation, though on the third day it reached 100.6° F. The pulse was never above 100. The greatest discomfort was from the expectoration of mucus, and the greatest pain from swallowing. The difficulty in swallowing gradually disappeared. The packing was removed on the fourth day. The stitches were out on the seventh day. The wound was entirely healed on the tenth day. The patient has been perfectly well ever since. There has been no difficulty in swallowing and no discomfort whatever.

CASE II.—Mrs. D. W. M., aged fifty-four, came to me, April 25, 1899, complaining of great difficulty in swallowing. Small pieces of solid food would remain in her throat and be regurgitated even as late as twenty-four hours after deglutition. The only throat disease that she ever had was diphtheria, twenty-five years ago. "As soon as I begin to eat, this place in my throat fills with liquid or solid food. What nourishment I get is what passes by after it is full. It is a great burden. I can eat hardly anything except bread. I cannot eat potatoes or meat of any kind. Sometimes it is hours before I throw up what I have eaten."

The symptoms began at the menopause. The first indication that she remembered was that it "tired her to swallow." She would have to try hard to get food by a certain place in the throat. It was particularly difficult to swallow medicines, and she would have to take them in milk. The first thing that she found she could not swallow were oysters. Pills would lodge and be regurgitated, and so would beans. There had been a loss of nine pounds during the past winter, the weight falling from 102 to 93 pounds.

Passage of the olive-tipped probang was arrested seven inches from the upper incisor teeth. It was easy to pass the probang thus far, but impossible to pass it farther. No tumor could be detected in the neck. There was no pain or tenderness expressed during the manipulations of this examination. The patient was emaciated, but of good color and strength. The heart, lungs, and kidneys were healthy.

The diagnosis in this case seemed reasonably certain, though not as positive as in the preceding one. The regurgitation of food was a less marked, perhaps a less well observed, symptom. The persistent and invariable filling up of the sac before food could pass was not so prominent a feature, though it undoubtedly occurred as often as food was taken.

The question of organic stricture arose in the consideration

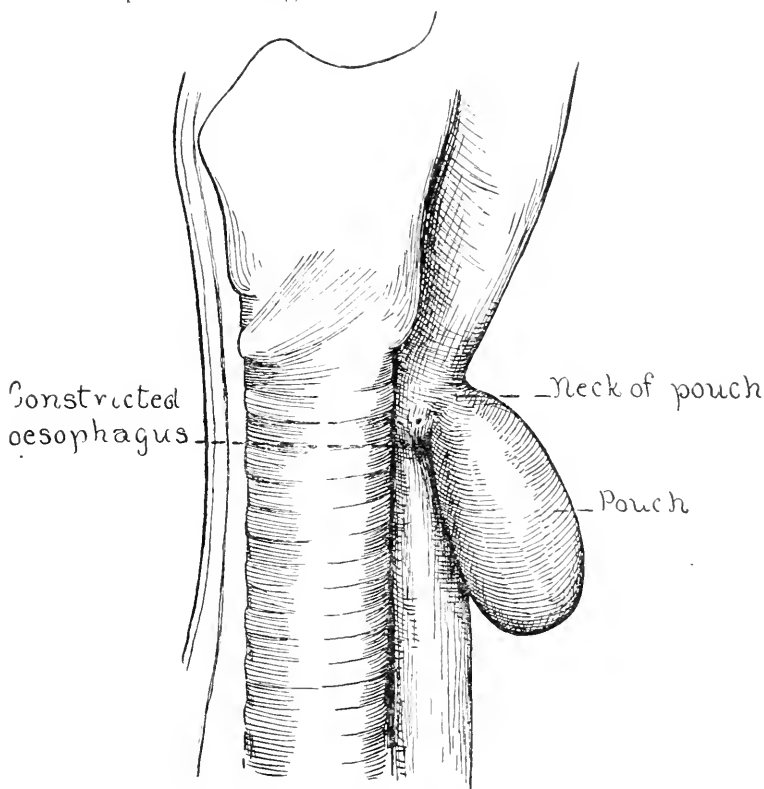


FIG. 6.—Situation, shape, and size of diverticulum in Case II.

of operative treatment. It could not be positively asserted that the obstruction was due to a pouch. On the other hand, the duration of the symptoms seemed to rule out obstructions of malignant origin. A benign stricture of the œsophagus, with dilatation just above the plane of constriction, would explain all the symptoms.

Gastrostomy was considered, as was also inversion of the pouch and suture according to Girard's method,—an operation

which will be described later. This operation was, however, deemed impossible, as it was apparent that, even if inversion could be successfully accomplished, the lumen of the œsophagus would undoubtedly be practically closed. Excision of the pouch was therefore decided upon, and on May 11, 1899, the operation was performed.

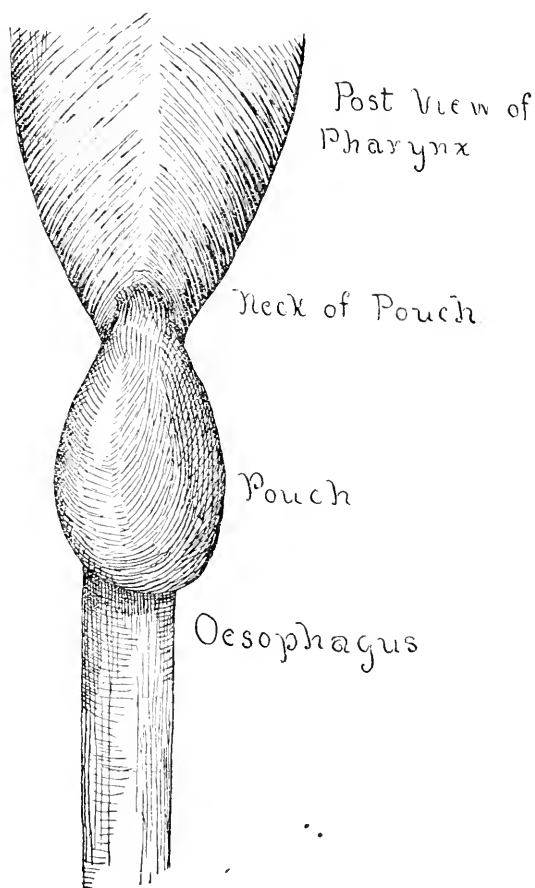


FIG. 7.—Same; posterior view. Case II.

The œsophagus was readily found by a dissection of the neck through an incision five inches in length along the anterior border of the left sterno-cleido-mastoid muscle. No important structure was divided except the anterior belly of the omohyoid muscle. A pouch was discovered behind the upper portion of the œsophagus.

The base of the pouch was attached at the posterior surface of the beginning of the œsophagus and the lower border of the pharynx (Figs. 6 and 7). The fundus of the pouch was easily separated from the prevertebral space, and withdrawn from the wound at a right angle with the œsophagus. The pouch was opened and explored, as in the preceding case. With the finger in the pouch, the probang introduced through the mouth could be guided into

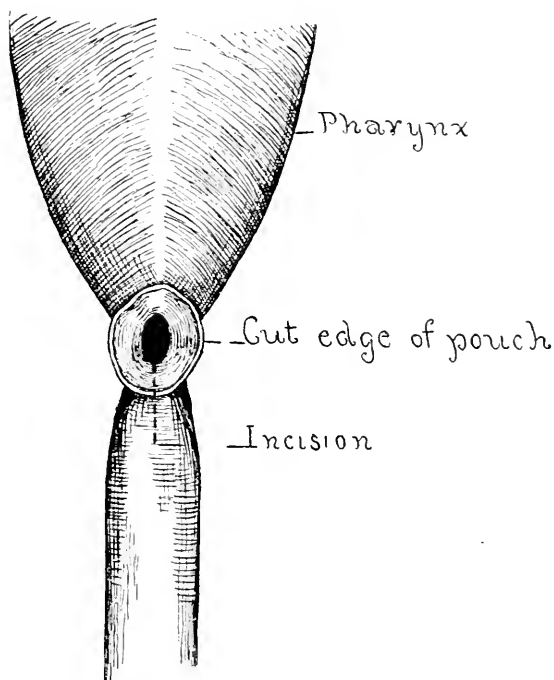


FIG. 8.—Case II. Showing posterior view of pharynx and œsophagus. The pouch has been cut off, leaving a circular margin about the sac. The dotted line shows incision through margin of pouch, neck of pouch, and constriction of the œsophagus.

the œsophagus. The index-finger was next passed carefully through the neck of the pouch into the œsophagus. A constriction lined with friable mucous membrane was here found. Passage of the finger through this constricted portion resulted in a longitudinal tear, which seemed to involve the greater part of the lining. The probang, after being passed by this constriction, could at one time be introduced into the stomach: at another it

could not. It seemed at the time to meet with an obstruction lower down. The parts were repeatedly examined to determine the exact shape, size, and position of the pouch, and its relations with the œsophagus and pharynx.

The pouch was smaller than that in the preceding case. It was about the size of half a hen's egg. The opening into the œsophagus was sufficient to admit easily the tip of the index-finger. The œsophagus just below the opening of the pouch had the diameter of a lead-pencil; externally, from the diverticulum

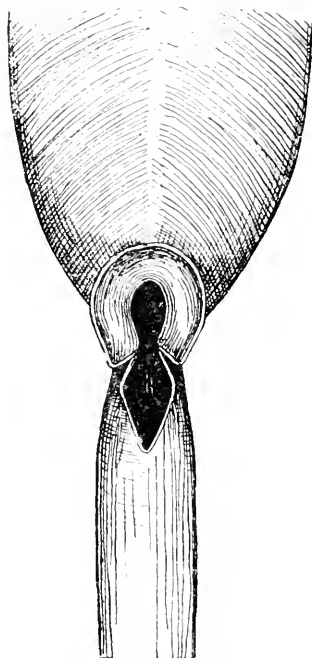


FIG. 9.—Case II. Showing incised pouch, neck, and œsophagus.

to a point as far as the dissection extended, it was perfectly normal.

Although the mucous membrane seemed normal, yet it was not, for it gave way under the gentlest pressure of the finger. There was a constriction at that plane, caused either by real pathological changes or by disuse. The tear in the œsophagus was converted into a longitudinal slit by extending the incision downward in the posterior wall through the lower border of the isthmus of the sac, and through the constriction (Figs. 8 and 9).

Fearing the formation of a permanent organic constriction at the site of the laceration, a portion of the pouch was utilized to enlarge the diameter of the contracted œsophagus. To accomplish this end, a considerable circular margin was left about the opening of the sac (Fig. 8). The lower portion of the margin was brought downward and placed in the gap made by the divided posterior surface of the narrowed œsophagus (Fig. 9).

The effect of this procedure was to increase the lumen of the œsophagus by a small area of tissue taken from the pouch (Fig. 10). The transposed tissues were taken, to be sure, from an abnormal sac; yet it was desirable that this tissue should be thin and elastic rather than thick and rigid. The subsequent effect of this plastic operation showed its advantage, for at no time was there the least obstruction to the passage of the probang into the stomach.

After making as good a joint as possible at the beginning of the œsophagus, I closed the mouth of the pouch by inverting the margins remaining after excision, uniting them by interrupted Lembert sutures. The joint, as a whole, was not as satisfactory as in the preceding case, owing to the difficulty of adapting the surfaces to each other. Leakage was expected to take place, and the external wound was therefore only partly closed, gauze wicks being left in contact with the line of suture and emerging from the external wound.

The operation was difficult. The patient bore it well; however, and came out of the anæsthesia in good condition. There was practically no constitutional disturbance. As was expected, leakage took place from the œsophagus, the wound soon giving escape to about half the quantity swallowed. The patient was able, however, to take into her stomach sufficient to keep her well nourished. The wound closed very slowly. The patient went home on July 29. At this time there was a comparatively small loss of food through the wound.

I have received the following note from this patient since her return home:

MANCHESTER, N. H., September 4, 1899.

DR. M. H. RICHARDSON.

DEAR SIR,—I am pleased to tell you that I am gaining every day. I can eat almost all kinds of solid food, and do not lose any through the wound. I lose very little liquid. I have gained four and a half pounds since I came home.

At the present time the wound is closed and she is in perfect health. Deglutition is normal.

This case presents several unusual features which seem interesting in connection with the etiology and diagnosis, and valuable in connection with the treatment. The pouch differed materially in shape and size from that of Case I. Instead of being deep and narrow, it was shallow and broad; its walls were thick, there was no thinning at the fundus, and there was no translucency. It seemed more like a simple dilatation of normal œsophageal wall above a constriction. Yet it was not such a dilatation, for only the posterior wall was affected, and only a portion of that. Moreover, the opening into the œsophagus was small, admitting only the index-finger.

The most interesting feature of this case was the condition of the œsophagus just below the opening of the pouch. This has already been described. The only evidence of constriction was in the extensive laceration of the œsophageal wall at this level caused by the introduction of the finger. Though the finger was very carefully introduced through the mouth of the sac into and down the œsophagus, this procedure resulted, as I have said before, in such extensive tearing of the mucous membrane that it seemed at first that there was no mucous lining whatever left. Such an injury to the normal œsophagus would, of course, be impossible, for it can be dilated to an excessive degree without laceration. Indeed, it may be said that round and smooth bodies, large enough to become firmly impacted, do not cause injury unless the pressure is prolonged for days, and usually not even then. I was entirely at a loss to account for the condition of the œsophagus, and to estimate its probable influence in causing the pouch. There was nothing in the history to throw any light upon the case excepting, perhaps, the attack of diphtheria twenty-five years before. This disease may have caused the formation of scar-tissue in the lower pharynx and upper œsophagus, the giving way of part of which resulted in the pouch. Moreover, the œsophagus may have been permanently narrowed at its begin-

ning, its mucous membrane being just enough altered to cause the constriction and to become itself fragile. But if there were such changes in the mucous membrane, none were noticeable in the muscular layers, for they seemed not abnormal. It appears, on the whole, likely that the theory already suggested in considering the diagnosis is true, viz., that extensive changes in the œsophageal wall resulted in constriction and sacculatation; that the usual course of pouch-formation took place; that as soon as there was a distinct bulging the effect of the constriction became greater; that, finally, deglutition became even more difficult than in ordinary cases of diverticulum, because of the combined effects of pouch and of stricture.

Besides being at a loss to understand the lesion, I was much perplexed as to how to remedy it. Two methods were available,—the one to perform some plastic operation upon the stricture, the other to leave a large tube in the œsophagus. By a plastic operation, the stricture might be permanently relieved after the Heinecke-Mikulicz method of pyloroplasty; or the strictured portion might be thoroughly excised and an end-to-end suture made between pharynx and œsophagus. In case neither method was practicable, a portion of the sac might be utilized to increase the œsophageal lumen at the level of constriction.

Neither of the first two methods seemed applicable to this case. Linear œsophagoplasty was prevented by the want of laxity in both pharynx and œsophagus. Moreover, the mouth of the sac was in the way. Complete resection of the œsophagus, including enough to remove both constriction and sac margin, was inadvisable for the same reason. It seemed best, therefore, as already described, to utilize a portion of the pouch to furnish a new posterior wall to the œsophagus at the level of the constriction (Figs. 9 and 10).

Of the treatment of œsophageal diverticula, Von Ziemssen and Zenker wrote in 1878 (see "Cyclopædia of the Practice of Medicine," by Von Ziemssen, Vol. viii, page 89):

"The radical cure of diverticula by operative procedure from without is at the present time one of our vain wishes:

yet we should hope that even this operation, conducted on Lister's plan, might at some future day be performed without danger. Nothing is to be hoped from attempts to destroy the diverticula by the introduction of astringent or irritating materials through the pharynx,—at least from our experience thus far, and from observation of the fact that we cannot, by compression or any other procedure, prevent the entrance of food, or of mucus and saliva, into the diverticulum, even for a short time."

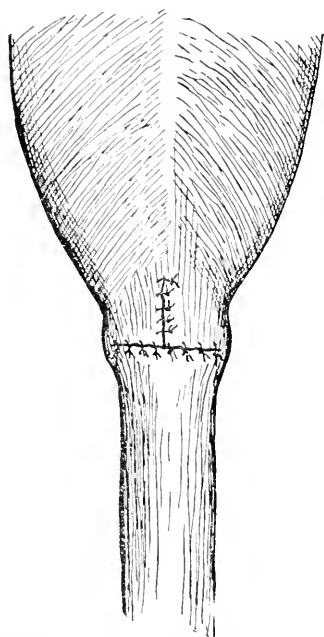


FIG. 10.—Showing œsophagus and pharynx after vertical suturing of the pouch opening and transverse suturing of the œsophageal slit. Case II.

The vain hope of Ziemssen and Zenker has become a reality: in the last twenty years some seventeen cases have been operated upon. Of these all have been successful but one. In the earlier operations the œsophageal wound was kept open with a drainage-tube. In the later operations the œsophagus has been immediately closed, the outer wound being packed temporarily with gauze. In one instance only have œsophagus

and outer wound been immediately sutured; and this is the only case in which the wound has healed by first intention. On theoretical grounds there should be no greater dangers of extravasation in suture of the œsophagus than in suture of the intestine, except, perhaps, that the inverted tissues of the œsophagus do not adhere together so quickly and so firmly as the approximated peritoneal surfaces, so that extravasations are more likely to occur. The contents of the œsophagus, however, are not naturally as septic as the contents of the intestine, and the quantity of fluid escaping would be small. It is, moreover, possible to cleanse the œsophageal part of the operative field before operation by means of swabs, gargles, and mild antiseptics. Furthermore, the danger from local infection in the parts about the œsophagus is not as great as infections in the peritoneum. Though ultimate effect in œsophageal phlegmons may be quite as serious as in cases of general peritonitis, there is a better chance of remedying an accident in the former than in the latter.

The tendency of operations upon the œsophagus is to be more radical, and to trust more to the efficacy of immediate suture. The dangers of external œsophagotomy seem to depend more upon an already existing infection than upon a contamination at the time of the operation. I have successfully resected the pharynx in three or four cases for the removal of tumors. In these cases the field of operation was necessarily infected from the pharynx. The infection was, however, a mild one, and did not retard the healing of the drained wound. The only case of œsophagotomy for foreign body that I have had has been a fatal one.¹

In this case an insane woman swallowed an ordinary teaspoon. The spoon was thin, and had sharp edges. It became lodged in the œsophagus, pointing downward, with the bowl at the transverse portion of the aortic arch. I removed the

¹ Since this paragraph was written, I have removed successfully portions of a man's suspenders which he had swallowed with suicidal intent some fourteen days before operation. The buckles became caught at the level of the aorta, where they were demonstrated by means of the X-ray.

spoon by external œsophagotomy without difficulty and apparently without doing any harm. The wound was left open, with a tube in the œsophagus. The patient died in the course of two or three days. The cause of death was not discovered. There was neither abscess nor phlegmon. It may have been that, like many insane patients, she did not have the power of withstanding a severe operation.

Numerous cases of external œsophagotomy for foreign bodies show clearly the dangers of this procedure. As already stated, however, it should be borne in mind that, at the time of the operation, the chief dangers are already present, and that it is to relieve these, quite as much as to remove the foreign body, that the operation is performed.

In a search through literature on the subject of œsophageal diverticulum, Dr. D. F. Jones has found the total number of reported cases to be fifty-six. Excision was performed in thirteen of these cases. Including the cases herewith reported and the one reported by Hearne at the meeting of the American Surgical Association in 1899, sixteen have been operated upon by simple excision. Two have been operated upon by Girard by the method of inversion and suture. Most of these operations have been successful. Butlin reports an operation by a London surgeon whose patient died of suppression of urine after the removal of the diverticulum. Niehaus removed the sac fourteen days after a gastrostomy, with fatal result.

The cases of œsophageal diverticulum reported now number fifty-six.

The usual method of treating œsophageal diverticula has been by excision and suture. In the earlier cases, attempts were made to keep the œsophagus open by means of probangs. These palliative methods need no further consideration. To prevent starvation and to prolong life, when excision of the pouch is impracticable or impossible, recourse should be had to gastrostomy.

In favorable cases, after removal of the pouch, the œsophagus should be immediately sutured. If the external wound is tightly closed, it should be reopened at the first indication of

wound infection. As a rule, it seems the safer plan to use temporary wick drainage. In case of complications which permanently prevent deglutition, and thus endanger life through starvation, gastrostomy must be resorted to.

To avoid opening the œsophagus, Girard, of Berne, has twice invaginated the diverticulum, so that its internal surface projected into the œsophagus. In two cases operated upon in this way recovery followed. Such a procedure seems to me, however, not nearly so satisfactory as removal of the pouch. The inverted sac rests in the œsophagus, and cannot but obstruct it more or less. The orifice, which after inversion points externally, is closed by three layers of sutures. This leaves a blind space which may become filled with blood and cause serious obstruction, or may become septic. In Girard's cases, however, the pouch became shrivelled and atrophied, and no longer obstructed the passage of food. It would seem a more dangerous operation than the opening of the œsophagus. Inversion of the pouch would probably have been impossible in Case II. Moreover, had inversion been successfully accomplished, the lumen of the œsophagus would undoubtedly have been completely obstructed. The method should, nevertheless, be considered as a practical resource in those cases in which, for any reason, excision and suture seem inadmissible.

The cause of pouches is unknown. It is by some thought to be congenital; by others to be a general weakening of the lower part of the pharynx and the upper part of the œsophagus in an area the least protected by muscular fibres. A small depression which here exists opposite the cricoid cartilage allows the momentary impaction of food. Constant swallowing, with temporary enlargement at this point, causes a bulging which after a while becomes so great that the food is permanently retained. The food remaining here causes the pouch to increase in size. With the increase in size the fundus of the pouch becomes thinner and thinner, as does rubber pellicle under pressure. When by sacculation the pouch has become pear-shaped, the enlargement is hastened by gravitation. As the fundus becomes more and more distended, its walls are cor-

respondingly thinned and weakened. One would therefore expect the pouch to increase more and more rapidly in both depth and capacity,—an expectation which clinical evidence justifies. The increase would doubtless be even more rapid than it is except for the restraints in the path of its enlargement.

The pathology of œsophageal diverticula shows that although they are called pressure diverticula, and though pressure is doubtless an etiological factor in connection with the presence of scar or other weakened tissues, yet a constriction of the œsophagus is not essential for their formation. Indeed, in all the cases hitherto reported no stricture has been found. Though strictures may not have an etiological influence in causing pulsion diverticula, they may, when situated low down, cause a general dilatation of the œsophagus.¹ From *a priori* reasoning, obstructions high up in the œsophagus cannot be without effect in the production of pressure pouches, for they cannot but increase the pressure. Changes in the lower pharynx and upper œsophagus which tend to result in bulging are unusual; a combination of the two would be extraordinary.

An interesting subject in connection with the operation is that of recurrence. Resection and suture necessarily leave scar-tissue at the very point where the bulging first started. Moreover, the condition of pharynx and œsophagus remains unchanged. So far as I am aware, however, there have been in these cases no recurrences after operation, although sufficient time has elapsed since the earlier ones for recurrences to take place.

¹ I have recently (March, 1900), operated upon a boy of eleven for impaction of the œsophagus with meat. The symptoms began after eating freely and hastily. There were abortive attempts at vomiting, and regurgitation of all fluids taken. The cervical portion of the œsophagus could be felt distended by a solid mass. I removed several mouthfuls of meat by means of long forceps, without clearing the œsophagus. The parents refused further treatment, and took the boy home. I believe that the whole œsophagus was obstructed, the original impaction taking place at the cardiac end.

POSTDIPHTHERITIC STENOSIS OF THE LARYNX
(RETAINED INTUBATION INSTRUMENTS
AND RETAINED TRACHEAL
CANULÆ).¹

BY JOHN ROGERS, JR., M.D.,

OF NEW YORK.

INTUBATION and tracheotomy are the two operations for the relief of the acute stenosis of laryngeal diphtheria. In this country, tracheotomy, though it still has some advocates, has been practically abandoned in favor of the less dangerous operation of intubation. But whether intubation or tracheotomy is employed, there are a certain number of cases in which, after recovery from the original disease, the stenosis will persist indefinitely. The number is probably less with intubation than with tracheotomy, but the mortality after the latter operation is so high that a fair comparison is difficult. My experience has been limited to cases which were originally intubated, and therefore this paper will consider more the subject of what the late Dr. O'Dwyer called retained intubation tubes than retained tracheal canulæ. But several of the cases described below, after first having been intubated, were subsequently tracheotomized, and so placed in practically the same position as those cases which have been tracheotomized at the outset. As both conditions (that of retained intubation tube and retained tracheal canula) can be easily cured by the same method of treatment, and as I think I can show that the anatomical cause of the stenosis is likewise the same for both, there seems nothing to be gained by considering them as separate and distinct forms of stenosis. Indeed, there is a loss. Dr. O'Dwyer

¹ Read before the New York Surgical Society, February 14, 1900.

has proved the inestimable value of his invention for the cure of retained tracheal canulæ. But he considered retained intubation tubes another matter, and incidentally one which was more or less the fault of the operator. Hence, when the condition has not been soon overcome, as he advised, by repeated careful intubation, avoiding all traumatism, tracheotomy, or thyrotomy, and excision of the obstructing tissues have seemed the only two resources. Neither will succeed. If, however, both conditions are regarded as the same and treated virtually on the same principle, success can be guaranteed.

The chief difficulty in the management of cases of retained tube has been the ignorance or uncertainty as to the usual anatomical cause of the persistent stenosis. The literature on this subject is scanty and unsatisfactory. O'Dwyer gave the results of his experience in a paper read before the American Pediatric Society in 1897. Without describing individual cases, he stated that the most common obstruction is an œdematous, chronically inflamed condition of the subglottic region. When the swollen tissues are relieved from the pressure of the tube they immediately come in contact and block the lumen of the larynx. He mentions as a less common cause of the stenosis cicatricial tissue. The dyspnea then does not occur immediately after the removal of the tube, but only after the lapse of some hours or days. The clinical histories of cases of retained tube are very suggestive of these two conditions. But without actual demonstration of their existence, and in view of other possibilities, notably, exuberant granulations, the average surgeon to whom these patients may be referred, after a prolonged course of repeated, careful intubation has failed to effect a cure, will generally attempt an exploratory thyrotomy and "give it up." As exceptional causes of the stenosis, O'Dwyer cites two cases in which granulations sprang from erosions produced at the base of the epiglottis by the head of the tube. These effectively blocked the lumen of the larynx when the tube was withdrawn, and also threatened to overtop and close the upper opening of the tube while it was in place. This difficulty was met by changing the shape of the

head of the tube, which relieved the ulcer of irritation and allowed it to heal. The hard-rubber instruments now in use, by the way, probably could not inflict such a traumatism.

He described one other case in which breathing without the tubes was impossible; and after death, which followed an unexpected autoextubation, it was found that there had been a slough of the cricoid cartilage. The loss of this cartilage he considered irremediable except by tracheotomy. Dr. O'Dwyer mentioned the possibility of a postdiphtheritic paralysis of the laryngeal abductor muscles, but called attention to its improbability, as such paralyses usually occur some time after the onset of the disease, whereas the stenosis exists from the beginning.

Galatti (*Jahrbuch für Kinderheilkunde*, xlii, 1896, p. 340) reports two cases, in one of which (not tracheotomized) there was found at autopsy a cicatricial thickening of the mucous membrane and perichondrium on the inner surface of the cricoid cartilages. In the second, respiration at the end of ten days was impossible without the tube, and therefore tracheotomy was performed. As the condition did not improve, a month later the larynx was opened by a thyrotomy. Just above the tracheotomy wound a cicatricial stricture was found and dissected out. The remainder of the larynx showed only a general swelling and redness. The raw surface left after excision of the cicatrix was skin grafted, and subsequently unsuccessful attempts were made to keep the larynx open by a tracheotomy canula fitted with an attachment which projected upward through the larynx.

Baer narrates a case in which there was repeated autoextubation for twenty days, and finally tracheotomy. The laryngeal stenosis persisted, and, as intubation was then impossible, thyrotomy was performed. This revealed some granulations near the tracheal fistula, and above, a fold of mucous membrane which apparently caught the tip of the intubation tube, and so prevented its insertion. There was no ulceration in the larynx. The granulations and the fold of mucous membrane seem to have had nothing to do with the stenosis, because, after their excision, intubation was immediately accomplished and

the tracheal canula removed; yet even then respiration without the aid of the tube was impossible. On this account, some weeks later a second tracheotomy was performed and death followed. The autopsy revealed a firm swelling just below the vocal cords, occupying the anterior and lateral parts of the larynx and markedly narrowing its lumen. This description corresponds so closely with the cause of the stenosis in other cases, namely, hypertrophic subglottic laryngitis, that there seems to be no reasonable doubt of its identity. The fold of mucous membrane interfering with the insertion of the tube, and the granulations near the tracheal fistula, for the reasons given above, could not have been the real cause of the stenosis.

Boulay, at the Twelfth International Medical Congress in Moscow, reported two cases of prolonged intubation. In the first, no trace of ulceration and no granulations could be found after the stenosis had persisted some three weeks without improvement, in spite of repeated careful intubation. Above the vocal cords the parts appeared normal, but below them there was plainly visible a reddened, rounded swelling which occupied the lateral parts of the larynx and nearly obliterated its lumen. A diagnosis of intense subglottic laryngitis was made. This corresponds very closely with the condition I have found in other cases. The subsequent history is interesting, as it shows the futility of the ordinary methods of treatment. Tracheotomy was performed, as there was constant danger of asphyxia should the tube have been unexpectedly coughed out.

Laryngoscopic examination after the tracheal canula had been worn for about a year showed that the subglottic tissues approached towards the median line from each side like a funnel, leaving between them only a narrow antero-posterior chink. This small opening was dilated by a laminaria tent, and though this was followed by repeated intermittent dilatation for months, respiration at the time of the report (several months thereafter) was only possible through the tracheal canula.

In Boulay's second case the tube had to be retained for about two weeks, and then, on account of the frequent auto-

extubation, tracheotomy was performed. A year later, as the stenosis was very marked, the interior of the larynx was exposed by a median division of the cricoid and thyroid cartilages, and was found to be filled with a dense mass of cicatricial tissue. This was dissected out, and an unsuccessful attempt made, as in Galatti's case, to keep the larynx open by the use of a tracheal canula fitted with an arm projecting upward.

Dr. William Northrup, of New York, has informed me in a personal communication that he has in his possession a larynx illustrating a condition somewhat similar to that found in Boulay's second case. The necessity for intubation continued for some weeks, but the frequent autoextubation finally necessitated a tracheotomy. Death followed about a month later from pneumonia, and at the autopsy the larynx was found completely occluded at its centre by a cicatricial diaphragm. There had evidently been a narrow ulcer extending circularly all the way around the interior of the larynx, and Dr. Northrup believed that it was produced by the intubation.

Dr. Somerset, formerly the resident physician at the Willard Parker Hospital, has kindly supplied me with the history of the following case, which illustrates not only the condition of the larynx, but also the prognosis of surgical operation for the relief of the stenosis.

CASE I.—M. M., three and one-half years of age, was admitted to the hospital with diphtheria on June 2, 1895. Intubation had been required six days previously. The stenosis persisted, and, as autoextubation followed and increased in frequency to such an extent as to threaten death from asphyxia, a tracheotomy was finally performed on July 13. Subsequently, intubation was again accomplished, but with the tracheal canula left in place in case of accidents, as the tube was still often coughed out. Frequent careful intubation with tubes so made as to inflict the least possible traumatism, as advised by Dr. O'Dwyer, was of no avail. Astringents, like alum, applied on the surface of the tube to the laryngeal mucous membrane, and afterwards curetting the larynx, were tried without success. The stenosis

did not improve, and the child could breathe only through the tube or the tracheal canula. In this condition she was transferred in October to Dr. Clinton Wagner, at the Metropolitan Throat Hospital. He opened the larynx by a median division of the cricoid and thyroid cartilages, and found the following condition (*New York Medical Record*, January 4, 1896): "The entire lining membrane of the larynx from the epiglottis to the cricoid cartilage appeared to be thickened and covered with a mass of what seemed to be granulations. After removing a portion with scissors and forceps, an attempt was made to pass an ordinary laryngeal sound upward and forward into the mouth, but without success. It encountered an obstinate resistance. Upon carrying the index-finger into the mouth and below the epiglottis, I could distinctly feel the point of my sound below this dense mass of adventitious tissue. Finally, I succeeded, with the aid of the knife and my finger, in forcing an opening sufficiently large to permit the sound to pass through into the mouth." The larynx was subsequently kept open and packed for several days, and then drawn together; but the tracheal canula was left in the lower angle of the wound. The result was not entirely satisfactory, and about two years later, Dr. G. B. Hope, in the same institution, again opened the larynx in the line of the old scar. In a personal communication he informed me that the soft parts were much thickened, and at the superior aperture there was a cicatricial band, which, together with thickened tissue below it, had rendered the larynx almost impervious. He divided and excised the obstructing parts, and subsequently employed intermittent dilatation to keep the larynx open. At present, however, the tracheal canula is still worn most of the time.

The stenosis in this case was evidently dependent at first either upon simple or inflammatory hypertrophy, or else upon cicatricial thickening of the soft parts. The granulations mentioned could have had little or nothing to do with any obstruction described as a "dense mass of adventitious tissue." It is conceivable that granulations may have resulted from the curetting to which the larynx was subjected before the first thyrotomy, but it is easy to mistake for them the vascular, thickened laryngeal mucous membrane which bleeds freely at

the slightest touch. In talking with other surgeons to whom such cases have been referred, I have found that granulations *per se* are considered the usual cause of the obstruction to respiration in any case of retained tube or tracheal canula, and operation for their excision seems generally to be advised. This is the only case, however, among those I report, in which I can find any ground for even a suspicion of their presence as an obstruction within the larynx. This fact should therefore be emphasized to prevent useless operations.

I am indebted to Dr. F. Tilden Brown for the description of the operation upon, and the conditions found in, the following case:

CASE II.—H. P., three and one-half years of age, was intubated for diphtheria at the Willard Parker Hospital on June 28, 1896. The child recovered from the diphtheria, and nothing noteworthy followed except that the laryngeal stenosis persisted, and the tube, after the elapse of the usual length of time, could not be removed except for a few moments for cleansing. About a month after admission autoextubation began, and Dr. Somerset, who was then the resident physician, informs me that frequently, after coughing out the tube, the child would run to him with the instruments, and, though deeply cyanosed and in extreme dyspnoea, would aid in the operation all he could by standing quietly and in the proper position while the tube was reinserted. Hence, the closure of the larynx could not have been complete and instantaneous; and therefore the lesion was probably vascular, thickened tissue, which became more or less rapidly engorged, and so blocked the lumen of the larynx when relieved of the pressure of the tube. A cicatrix would not contract enough to produce obstruction for several days, and granulations would close the larynx immediately.

No improvement occurred with intubation, and therefore he was transferred to the Presbyterian Hospital, where, on July 31, 1897, Dr. Brown opened the larynx by median division of the cricoid and thyroid cartilages. Careful inspection showed an even thickening of the soft parts throughout the whole interior of the space inclosed by these cartilages. There was no sodden or watery appearance, such as might be produced by cedema. Fur-

thermore, the thickened tissue seemed firm and vascular. Bleeding was easily excited by sponging, yet there was nothing like ulceration nor any sign of cicatrization. The soft parts within the larynx were apparently covered everywhere by epithelium. The even thickening of all the tissues made it difficult to distinguish the vocal cords and ventricles from the subglottic area. With a view to decreasing the amount of soft tissue, which appeared the only obstacle to free respiration, and at the same time to replace the vascular tissue by non-vascular, cicatricial tissue, a vertical strip was cut from the whole thickness of the soft parts on each side of the inner surface of the larynx. The hemorrhage was checked by packing, which was removed after the bleeding had stopped, and the larynx then closed. A few hours later dyspnoea occurred, and a tracheotomy canula was inserted through the lower angle of the wound. Healing was uneventful, but the laryngeal stenosis was never relieved sufficiently to allow of breathing without the canula, and the patient finally left the hospital in this condition, to die a few months later of pneumonia.

The report of the pathologist upon the excised strips of tissue stated that they showed "infiltration with many small round cells. In places apparently granulation tissue. Over some thickened areas there is thin mucous membrane."

It will be noted that at the time of operation the stenosis appeared to be caused solely by simple thickening or hypertrophy of the soft parts. There was no cicatricial tissue, and nothing in the pathologist's report indicates its presence. As no ulceration was seen, granulations could not have been the obstruction; and the "granulation tissue" described by the pathologist must have been a part much infiltrated with the round cells of the chronic inflammatory process which gave rise to the general thickening of the tissues. The excision of this tissue was of no benefit.

I am indebted to Dr. Dillon Brown for the history of the following case:

CASE III.—J. G., fourteen months of age, was intubated by Dr. Brown during the first week of February, 1897. The child had had a pharyngeal diphtheria for several days, and in-

tubation was required thirty-six hours after the first symptoms of involvement of the larynx. The diphtheria gradually subsided, but the laryngeal stenosis persisted, and necessitated retention of the tube. The tube began to be coughed out some three weeks after the first intubation; but respiration, though possible for an hour or two without the tube, could never be carried on for any length of time through the natural channels. Finally, on the twenty-eighth day, the tube was coughed out, and, before it could be reinserted, the child was asphyxiated. At the autopsy, the intralaryngeal soft parts were found to be evenly thickened to such an extent that the lateral portions of the larynx were in contact in the median line. The tissues were moderately soft, and compressible enough to permit the introduction, without undue force, of the tube ordinarily employed for a child of this age and size. There were no ulcerations and no cicatrices. The specimen was not examined under the microscope until December, 1899, when Dr. W. N. Berkeley, the pathologist of Dr. Brown's laboratory, very kindly cut some sections transversely through the centre of the larynx and furnished me with the following report:

"The mucous membrane, submucosa, and remaining soft parts within the larynx appear much swollen and also thickened by a growth of new cells. The vessels are numerous and congested. There is an irregular increase in the superficial epithelium and a hypertrophy of the subepithelial papillæ. There is no evidence of ulceration with loss of substance. The striated muscle fibres, both in front and behind the arytenoid cartilages, are present in the usual amount, but, like all the other soft tissues, are infiltrated with columns of small round cells. In all probability this infiltration would interfere with or abolish the function of the muscles. The cartilage is normal."

The stenosis in this case was clearly dependent upon a thickening or hypertrophy of the intralaryngeal tissues, accompanied and probably caused by the continuation of the original exudative inflammation which seems to have become more or less chronic. The results of the microscopical examination of the tissues taken from this patient and from H. P. are practically the same. Involvement of the muscles in the in-

flammatory process, and their consequent loss of function, might permit the tube to be easily coughed out. At any rate, when the tube is retained for any length of time, frequent autoextubation seems sooner or later to occur. That it is a dangerous, and may be a fatal, complication is evident.

CASE IV.—C. S., five years of age, required intubation in the course of a diphtheria at the Willard Parker Hospital on May 20, 1899. She gradually recovered from the diphtheria, but not from the laryngeal stenosis. The tube was first removed at the expiration of five days, but had to be immediately reinserted. Thereafter it was taken out and a clean one substituted about once a week until June 15, when breathing through the natural passages, though somewhat labored, was found to be possible. But the dyspnea increased, and on June 23 intubation was again required. Careful removal followed by the immediate reinsertion of a clean tube every week or two followed, but without success. Dr. O'Dwyer's "special" tubes for such cases were faithfully tried with a similar result.

In November, I heard of the difficulty, and suggested the long-continued, *uninterrupted* use of as large a tube as could be introduced into the larynx. I was informed that this plan was being carried out; but the mother became impatient, and on January 25, 1900, brought the child to Gouverneur Hospital. The following day, under chloroform anaesthesia, I removed from the larynx a metal No. 4-5 tube: in other words, a tube not larger than that ordinarily employed for a child four or five years old. I found that the larynx was almost completely blocked, and immediately reinserted a No. 11-13 tube, the largest I had. This slipped in place without requiring any force, or at least not more than would be equivalent to a pressure of about three pounds on the handle of the inserter. This case is still under treatment. The tube was removed March 1, and respiration without it was possible for several hours. There was thus marked improvement. But it seemed wise to replace the tube for another six weeks, which have not yet expired. There is every prospect, however, of a permanent cure.

CASE V.—I. B., four years of age, was intubated in the Willard Parker Hospital for diphtheria in December, 1896. She recovered from the diphtheria, but the stenosis persisted. The

tube was changed about once a week for cleansing, but had to be replaced almost immediately. In February, autoextubation began, and gradually increased in frequency until it occurred several times a day. Dr. O'Dwyer's "special" tubes were tried, and also large-sized tubes, even a No. 8-10. But nothing could be kept in the larynx for more than a few hours at a time; and therefore in March, as there was constant danger of asphyxia, tracheotomy was performed. A month later intubation was again accomplished, but the tracheal canula was left in place in case the tube should be coughed out again. As it was not, the canula was finally removed and the tracheal fistula allowed to heal. The tube was changed about once every ten days or two weeks, but the stenosis persisted; and decided expedition in the insertion of a fresh tube was necessary to prevent asphyxia. Respiration without the tube was entirely impossible. In addition to the regulation 4-5 tube ordinarily used for a child of this size, Dr. O'Dwyer's "special" tubes were again employed. Finally, as no improvement occurred, she was transferred to Gouverneur Hospital on October 15, 1897. She was then carrying a rather small tube in her larynx, apparently with the idea that the stenosis was due to traumatism inflicted by the tube, and that if the pressure were made as slight as possible the stenosis would subside. But about a week after admission the tube was unexpectedly coughed out, and death from asphyxia only prevented by an impromptu tracheotomy, performed, I believe, with a pen-knife, by the house surgeon, Dr. Pafford. Subsequently, intubation was again accomplished, at first with the tracheal canula in place; later, as autoextubation was not repeated, the canula was removed and the fistula allowed to close.

The condition seemed to require operation, and on January 10, 1898, the stenosis having persisted unrelieved for a year, I opened the larynx by a median vertical incision through the cricoid and thyroid cartilages. The mucous membrane presented a thickened velvety appearance, rendering the vocal cords and ventricles indistinguishable from the other parts. The tissues were evidently very vascular, and after sponging bled freely. There were no cicatrices and no ulceration. The epithelium was everywhere intact. On bringing the parts together, it was found that the thickened mucous membrane on the inner surface of each side of the larynx came in contact, and effectually blocked respi-

ration. This vascular thickening or hypertrophy of the soft parts in the interior of the larynx was the sole cause of the stenosis. I therefore passed a silk suture through the cartilage and thickened mucous membrane on each side and tied it on the outer surface of the corresponding thyroid ala. This retracted the tissues enough to allow easy breathing when the larynx was closed. But infection followed, and in the course of the next few weeks the greater part of the thyroid and cricoid cartilages sloughed out. The case was discharged April 20, 1898, apparently condemned to the permanent use of a tracheal canula.

She returned in August with a dense cicatrix and some dermatitis around the fistula. I then found that a probe could be passed with some slight difficulty through the larynx from below up into the mouth. Under chloroform anæsthesia this aperture was rapidly dilated with urethral sounds until a No. 24 F. could be passed. This was followed by the insertion of a 4-5 intubation tube. The tracheal canula was then removed and the fistula closed spontaneously within a short time. The tube was not disturbed until the first of October, when, as there was a noticeable odor about the breath, it was taken out and a No. 6-7 tube substituted. At the time of the change of tube, it was found that the stenosis was still very marked. The 6-7 tube fitted rather tightly in the larynx, and was large for the size and development of the child, who appeared about three years old.

This tube was left undisturbed for about five weeks. After its removal at the end of this time (November, 1898), natural breathing was obtained, except that at first there were several attacks of coughing followed by severe inspiratory dyspnœa. It was somewhat alarming, but gradually disappeared under the administration of a little morphine. Apparently, the abductor muscles had become more or less atrophied in their long period of disuse, while the intubation tube or tracheal canula had been worn, and did not open the larynx quickly at the end of the act of coughing. There is at present (February, 1900) no dyspnœa whatsoever. The voice, however, is harsh and unnatural for a child. So far as can be judged by palpation of the neck through the rather dense cicatrix which is present, the thyroid and cricoid cartilages appear to have been at least partially regenerated.

Thus this case was twice tracheotomized for autoextubation, and subsequently reintubated without improvement of the

stenosis, between December, 1896, and January, 1898. In the latter month the larynx was opened, and the stenosis proved to be dependent upon thickening of the intralaryngeal soft parts. The attempt to bind this hypertrophied tissue to the thyroid alæ by a vertical cicatrix resulted in slough of at least part of the cartilage, and the development of a stenosis which was apparently worse than before. The use of small intubation tubes, frequently and carefully changed with the object of inflicting the least possible traumatism upon the larynx, was of no avail; while the insertion of a tube as large as could be borne without lacerating the parts, and its retention uninterrupted for a long period, effected a comparatively rapid and a permanent cure.

CASE VI.—M. W., aged four years, was intubated for diphtheria at the Willard Parker Hospital in October, 1896. Like the other cases, he recovered from the diphtheria, but not from the laryngeal stenosis. In the first part of November he began to cough out the tube more and more frequently. This difficulty was successfully overcome by increasing the size of the tube up to the largest which could be introduced without much force. But they were never left in place for more than a week or two at a time. After the large tubes had been worn with frequent changes for a month, smaller ones were by degrees substituted, until it was found that a No. 2 tube could be kept in the larynx without difficulty. In May, 1897, as there was no improvement in the stenosis, he was transferred to the Manhattan Eye and Ear Infirmary for laryngeal treatment. But soon afterwards, having contracted scarlet fever, he was sent back to the Willard Parker Hospital, and in October, 1897, transferred to Gouverneur Hospital. Small intubation tubes, or as small as the child could breathe through, were used with a change every two weeks.

In December, the child was one day found suffering with rather marked dyspnoea, and examination showed that the small tube had slipped down out of reach of the finger, inside the larynx: but after repeated trials it was finally extracted in the usual way. The stenosis thereafter seemed to become, if anything, worse. Without the tube no air could enter the trachea, and changing the tube had to be done with rapidity. Beginning with March, 1898, a

No. 4-5 tube, or one suitable to the size of the child, was inserted, and left undisturbed for a month or six weeks. No improvement occurred, and in August a 6-7 tube was employed. Upon the removal of this about seven weeks later, in October, respiration was barely possible for the first time. Acting on the hint given by the change for the better following the use of a large tube, the 8-10 tube was tried, but could not be inserted without considerable force. The 6-7 tube was therefore replaced, and after the elapse of a month, or in November, 1898, this was taken out, and no dyspnœa followed.

During the first twenty-four hours there were frequent attacks of coughing, after which inspiration was very difficult. Asphyxia seemed imminent. But under the administration of morphine this spasm of the adductor muscles gradually subsided, and two weeks later the child was dismissed with the stenosis entirely relieved. At the present time (February, 1900) there is apparently more or less catarrhal laryngitis, and occasionally, after coughing or violent exercise, a stridulous inspiration but no dyspnœa. The only vocal sounds of which the child is capable are peculiar harsh whisperings. Laryngoscopic examination is not tolerated.

The stenosis in this case persisted unrelieved from October, 1896, until October, 1898. The obstruction was complete, and immediately followed removal of the tube, and in all probability was dependent upon the thickening and hypertrophy of the soft parts found in the cases in which the interior of the larynx was seen. Intubation with small tubes frequently changed caused no improvement; while intubation with as large a tube as could be introduced without extreme violence, and its retention in the larynx for a long period undisturbed, brought about a cure.

CASE VII.—M. R., three years of age, was admitted to the Willard Parker Hospital, February 2, 1899, with diphtheria, which had required intubation two days previously. Four days after admission he began to cough out the tube,—at first every day or two, and then several times a day. Respiration without the tube was not possible for more than a few minutes. The stenosis persisted, and autoextubation became more frequent and dan-

gerous, and therefore, on February 18, tracheotomy was performed. On March 31, or a month later, intubation was again attempted; but it was found that the tube could not be retained, and the tracheal canula had to be allowed to remain. Another unsuccessful attempt to substitute intubation for tracheotomy was made on April 18.

At these trials it was found that neither a large size nor a "special" tube could be kept in the larynx. It was always soon coughed out, and the resulting respiratory obstruction followed immediately, and was complete. In other words, the stenosis must have been dependent upon a vascular thickening of the intralaryngeal soft parts, as described in the other cases. A cicatrix would hardly close immediately when relieved of the pressure of the tube, and granulations which might act thus would certainly have bled, and hæmorrhage was never noted. Finally, on June 27, the child was dismissed from the hospital breathing through the tracheal canula. Early in October I examined him at Gouverneur Hospital and found a rather dense cicatrix surrounding the tracheal fistula. When the fistula was occluded, inspiration was impossible, but a small amount of air could be expired; therefore the lumen of the larynx was evidently not entirely obliterated. On October 19, 1899, under chloroform anæsthesia, I succeeded in passing a uterine probe from the tracheal opening up through the larynx into the mouth. This was followed by male urethral sounds, beginning with the smallest until a No. 21 F. was reached. The next larger size met with such firm resistance that it seemed unwise to force it through and lacerate the unyielding tissues. A 4-5 intubation tube was then inserted in the usual way, but required really considerable pushing with counter pressure on the larynx externally before it slipped in place. The tracheal canula was removed. No cough and no pain followed this rather violent treatment of the larynx, and no autoextubation occurred. The tube was changed at the end of ten days under chloroform anæsthesia, and the next larger size, or a No. 5-7, substituted. This was allowed to remain undisturbed for five weeks, during which the child passed successfully through a rather sharp attack of pneumonia. On December 4, 1899, the tube was removed, again under general anæsthesia: and up to the present time (February, 1900) there has been no return of the stenosis and no difficulty with respiration.

The parents inform me, however, that at night breathing is rather noisy, although there seems to be no dyspnoea. At first the voice was entirely absent, but lately it has begun to return, and, though hoarse and harsh, is not unsatisfactory.

This case is noticeable on account of the frequent and uncontrollable autoextubation, which was dangerous, and necessitated tracheotomy. Attempts to substitute intubation for tracheotomy twice failed on account of the same dangerous complication. I am unable to say whether this happened because intubation was tried too soon after the tracheotomy, or because large enough tubes were not used. At any rate, the third attempt, undertaken after the larynx had been allowed to rest for six months, or from April to October, succeeded; and then a tube was employed as large as could be forced into the larynx without rupturing the tissues. The continued use of such a tube, changed only when it became loose, effected a comparatively rapid cure. As stated in the history, the stenosis was probably dependent upon a vascular thickening or hypertrophy of the intralaryngeal soft parts.

As regards the etiology of postdiphtheritic stenosis of the larynx and retained intubation tubes, the views of the late Dr. O'Dwyer are, of course, worthy of the greatest consideration. Nevertheless, I believe they are wrong. He maintained that the condition was the fault either of the operator or of the instruments, which means careless or unskilful insertion or the use of a poorly constructed, and therefore improperly fitting, tube. Formerly, while he was experimenting with and perfecting his instrument, he sometimes encountered ulcerations and granulations; and the two cases he reports of granulations at the base of the epiglottis, where it impinged upon the head of the tube, might properly be counted in this class. At all events, there is no other record of a similar occurrence from the use of the hard-rubber tube as at present made. It must be admitted, however, that erosions and ulcerations are possible with a metal tube, as its surface soon becomes rough from a deposit of what is apparently calcareous matter. But whether

ulcerations and subsequent cicatrices may or may not be thus produced has very little to do with the matter, as they do not seem to be the usual cause of the stenosis in the reported cases.

If lack of skill on the part of the operator could occasion the stenosis, instances of it would be common; whereas, compared with the number of intubations, the necessity of prolonged or permanent retention of the tube is admittedly rare. Intubation is constantly being performed, and if there were often any difficulty with the subsequent removal of the tube, it would be constantly heard of in medical societies. The instance of necrosis of the cricoid cartilage mentioned by Dr. O'Dwyer may, of course, be cited as an example of unskillfulness or bad judgment on the part of the operator in using, during the acute stage of the stenosis, too large a tube or too much force in its insertion. But it is conceivable that such an accident could have happened without intubation. It seems, however, to be the only case of its kind on record; and if it was due to the tube, it might properly be mentioned as an exception which proves the rule. It is not the usual cause of a postdiphtheritic stenosis, and cannot be held to prove anything against the ordinary operator. I mention this matter of etiology somewhat at length because, following the authority of Dr. O'Dwyer, there seems to be a very general belief that either the operator or the tube is at fault. And it is important, from a medico-legal aspect, as well as for the sake of intubation, to show that neither the operator nor the tube ordinarily has anything to do with a possible postdiphtheritic stenosis. It is granted that lacerations and serious permanent damage to the larynx can, of course, be inflicted by extreme lack of skill or care; but to claim that this must have happened in all, or even some, of the cases of retained tube is not borne out by the facts. A certain amount of traumatism is necessarily inflicted at every intubation, and if, by any chance, a chronic stenosis follows, the traumatism is always blamed for it. That this is wrong, at least in the average case, is proved to my mind by the pathology of the condition. It is the same whether the stenosis follows intubation or a primary tracheotomy.

Emil Köhl, in his inaugural address at Zurich in 1884, described very fully the pathological condition of the larynx in cases of chronic postdiphtheritic stenosis with retained tracheal canula. This article demonstrates most conclusively that not the least frequent cause of the difficulty is a chronic hypertrophic subglottic laryngitis, a chronic thickening of the soft parts between the vocal cords and the lower border of the cricoid cartilage. The hypertrophy of the soft tissues was so marked that respiration, except through the tracheal fistula, was impossible. These cases, of course, had never been intubated, and therefore the chronic inflammation within the larynx cannot be charged to the irritation or traumatism consequent upon the insertion or wearing of an intubation tube.

Another and more frequent cause of the stenosis was shown to be granulations and cicatrices in the neighborhood of the tracheal wound or canula. And the nearer the canula was to the vocal cords the worse were these complications. The vicinity of the upper end of the wound was more prone to granulations and cicatrices than the lower, as the upper end generally involved or was close to the larynx where the mucous membrane is more loosely attached than below. This bears upon the cause of the stenosis described in some of the reported cases of retained tubes which have finally been tracheotomized. If the tracheotomy has existed long enough, it, and not the original intubation, may have given rise to the cicatricial tissue.

Incidentally, it may be noted that the number of devices described by Köhl for remedying a postdiphtheritic stenosis well illustrate the difficulties in the way of successful treatment other than by intubation.

Dr. O'Dwyer believed that the usual cause of the obstruction in cases of retained tube was virtually a chronic inflammation of the intralaryngeal soft tissues; but I can find no detailed report by him of cases in which this was found. That it is entirely correct, however, is conclusively shown by the histories of Cases II, III, and V. In each there was a simple thickening of all the soft tissues. No ulcerations, and, of course, no granulations, could be detected. The microscopical

examination of a cross section of the larynx of Case III showed a hypertrophy of the mucosa and submucosa, with a round-celled infiltration of the vascular subjacent tissues. And a similar examination of the strips of tissue excised from the larynx of Case II corresponds very closely with this in respect to the thickening and infiltration, though the remark about there being "in places granulation tissue" is a little confusing. But as the gross appearances of both larynges were so closely similar and no ulcerations were seen, I believe that this must refer to some collection of round cells in the interstices of the tissue, which, as the specimen had been isolated from the surrounding parts, was like the granulations of an ulcer. Furthermore, the report speaks of it as *apparently* granulation tissue. Hence, for all practical purposes, these cases represent the same condition of chronic inflammation and hypertrophy.

The first case described by Boulay was only seen by the laryngoscope, and in a child this is difficult; but apparently the only cause for the stenosis was a marked subglottic thickening. At all events, no ulceration and no granulations could be detected. Baer's case can only be assumed to be in this class by inference, though this is rather strong. The case was tracheotomized for frequent autoextubation, and, as the stenosis persisted, the larynx was explored by a thyrotomy. The tissues thus seen are described as reddened but not ulcerated. A fold of mucous membrane was cut away, and also some granulations near the tracheal fistula. Nevertheless, the stenosis was unrelieved; and as nothing else is mentioned as a possible cause of the obstruction, it must have been the "reddened" and so probably inflamed and thickened soft tissues.

I am inclined to believe that Case I was another instance of the same condition, but the report of the operator must stand as evidence that the stenosis was dependent upon ulceration and cicatricial contraction. In this case, however, after intubation had been continued for several months, the larynx was curetted, and ulceration, if it had not previously existed, might then have followed.

Boulay's second case seems probably to have been one of

cicatricial stenosis. The larynx was inspected during the course of a thyrotomy after a tracheotomy for frequent auto-extubation, and was found filled with cicatricial tissue. Still, it is not impossible that this could have been an extreme development of the common cicatrix above a tracheotomy wound. Practically, the same history and condition are revealed in Galatti's second case, but the general redness and swelling of the soft parts described as existing above the cicatrix near the tracheotomy wound, makes me believe that the true cause of the original stenosis was this hypertrophy, and not, as given by the author, the cicatrix. There is apparently no reason to doubt, however, that Galatti's first case was one of cicatricial stenosis occurring within the ring of the cricoid cartilage. He was compelled to cease intubating after the tube had been coughed out a number of times, and, as tracheotomy was refused, the child finally died from increasing dyspnoea. Ulceration, as Dr. O'Dwyer has demonstrated, is most prone to occur in this region from the use of too large a tube. But, like the instance of necrosis of the cricoid cartilage, it is an exceptional accident, and can prove nothing against the operator or the instrument. If continued intubation had been permitted in this case of Galatti's, the ulcer would have healed, and been prevented from contracting by the presence of the tube.

Dr. Northrup's case is the only other I have been able to find in which the larynx was plainly obstructed by a cicatrix apparently the result of the intubation. Unfortunately, I am only familiar with the specimen, and so cannot intelligently discuss its history; but this and the one reported by Galatti and the necrosis of the cricoid cartilage narrated by O'Dwyer seem to be all that can be directly traced to the tube, and, in view of the circumstances, should be considered only as among the dangers of a necessary operation. O'Dwyer's cases of exuberant granulations at the base of the epiglottis seem to have occurred before his instrument was brought to its present perfection, and need simply be mentioned as warnings of possibilities. A metal tube which quickly becomes roughened by an apparently calcareous deposit might readily occasion a

similar trouble. It could be overcome, as O'Dwyer suggested, by a rubber tube, with the head built up to relieve the ulcer of pressure, and in addition by curetting.

To sum up: the commonest cause of postdiphtheritic stenosis necessitating long-continued intubation is a hypertrophy of the subglottic tissues accompanied by a chronic inflammation. The intubation is in no way the cause of this, as it occurs irrespective of the operation. Less often there is an ulceration, and subsequently a formation of a greater or less amount of cicatricial tissue and contraction. This likewise is not the result of the intubation except in rare and practically unavoidable instances. But it certainly may follow a tracheotomy, and in a larynx already chronically stenosed it makes the condition worse, but not necessarily more difficult to cure. Exuberant granulations *within* the larynx apparently do not occur with intubation, no matter how prolonged. I should add that in a recently published book on "Tubage et Tracheotomie en d'hors du Croup," by Antoine Sargnon, a half-dozen more cases of retained tubes are cited in which ulceration and cicatrization are mentioned as causes of the stenosis, but without details; and, as I could not find the original references, I cannot well discuss them.

The frequency of the occurrence of a postdiphtheritic stenosis accompanying intubation is a matter of some interest. Dr. Dillon Brown, of New York, informs me that he has encountered it about once in every seventy-five or 100 cases. Dr. C. G. Jennings, of Detroit, with an equally large experience, writes that he has never met with the severer forms of the difficulty, but that in two or three instances he has had to continue the intubation as late as the third week after the first insertion before recovery was complete. His associate, Dr. Shurley, has never had any trouble with delay in the removal of the tube. Galatti, in the article above referred to, states that he had these two chronic stenoses in thirty-one intubations. He reports Ranke as having had one case in many hundred, Hubner, one in 250, and Bókai two in 800. Dr. George McNaughton, of Brooklyn, writes me that he has had but few cases in many

hundred, and these recovered at the latest within several weeks. At the Nursery and Child's Hospital in this city there have been no cases of noticeably prolonged intubation. The New York Foundling Hospital has had six cases in a total of approximately 500. Investigation of the statistics at this institution, by the way, forcibly illustrated the advantages in the use of the diphtheria antitoxin. The house physician complained to me that, before the introduction of this remedy, his predecessors had always averaged at least one intubation a week, and thereby obtained much valuable experience; but about the time he came into the hospital, the rule was instituted that antitoxin should be given to every patient as soon as there was any suspicion of diphtheria. The result was that he had never in a year's service had a single opportunity to practise the operation on a living subject!

In the Willard Parker Hospital, about 900 cases have been intubated in the last six years; and the same experience with antitoxin was noted as in the Foundling Hospital, but not so impressively, as the patients are generally brought in after the disease has existed some time. The internes of several years ago, however, had far more experience with intubation than those at present on duty. In these 900 cases there have occurred eight of chronic stenosis. A reasonable estimate of its average frequency would be therefore not far from once in every 100 intubations.

Their treatment by surgical operation, which has generally implied opening the larynx by median division of the thyroid and cricoid cartilages and excision of the obstructing tissues, has been noticeably unsuccessful. The various ingenious devices, such as skin-grafting the resulting raw surface or the insertion of some form of tracheal canula made on the principle of Dupuy's T-shaped instrument to keep up a more or less constant dilatation, and at the same time allow respiration through the fistula, have all failed.

Many of the less troublesome cases will recover after two or three or four weeks with intubation as it is ordinarily practised, or with the O'Dwyer "special" tube. This has the re-

taining swell transferred from the middle to the lower end, and is so made as to relieve the supposedly irritated and swollen tissues of all the pressure possible. A local application of an astringent like alum powdered on the outside of the tube previously coated with gelatin, as advised by O'Dwyer, will occasionally succeed. But in spite of these measures, coupled with very careful intubation, some of the patients will not improve, and there seems to be no way of differentiating these at the outset from the other less persistent cases. The lesion is apparently the same, and therefore I believe that nothing is to be gained by treating them differently after the acute stage of the inflammation has subsided. Before that time, anything but the most gentle interference would be dangerous. If only the chronic postdiphtheritic stenosis is not believed to be dependent upon previous intubation, the course is clear. On the other hand, if one clings to the idea that the stenosis is in consequence of the intubation, and that therefore something else must be tried, a failure will result. Dr. O'Dwyer long since proved that the continued uninterrupted use of as large a tube as could be crowded into the larynx was an almost infallible cure for the stenosis necessitating indefinite retention of a tracheal canula. It applies just the same to the stenosis accompanying intubation, and is proved in Cases V, VI, and VII. To these I am enabled, through the kindness of Dr. Kennefick, of this city, to add one more. He had in his service at the Manhattan Eye and Ear Infirmary a child with a postdiphtheritic stenosis, which had necessitated a retention, with frequent changes, of the ordinary-sized tube for five months. At my suggestion, this small tube was removed and one substituted for it as large as could be introduced without lacerating the tissues. This was not disturbed until the elapse of about six weeks, when the stenosis was found to have disappeared, and has not since recurred. In Case VI, which was similar in never having been tracheotomized, there was no improvement in the stenosis from October, 1896, until August, 1898. Then this principle of using as large a tube as possible was adopted, and a cure resulted in eleven weeks, during which

time the tube was changed once. Case V suffered from the stenosis and several operations, alternating between intubation, tracheotomy, and laryngotomy, from December, 1896, until August, 1898, and then, with a large tube changed once, finally recovered in about ten weeks. In Case VII, the stenosis which had existed from February until October, 1899, was not relieved by the ordinary method of intubation, and, of course, not by tracheotomy. The use of a large tube, changed once, and that as soon as it became loose, for a still larger one, effected a permanent cure in about six weeks.

As tracheotomy in these cases seems often to add a cicatrix to the stenosis, even if it had not previously been the cause of the obstruction, it is interesting to note that the gravity of the prognosis, so far as the stenosis is concerned, is not materially increased. That a tracheotomy may be necessary is evidenced by the history of J. F., who died before relief could be obtained after coughing out the tube. I am unable to say why autoextubation is so frequently a complication. It seems to occur about the third or fourth week after the first intubation, and may be dependent upon a loss of power in the laryngeal muscles owing to their involvement in the chronic inflammatory process. It is not apparently from a true paralysis; at least, no evidence of this could be found in the only specimen examined microscopically. But when it occurs repeatedly, and is not checked by increasing the size of the tube, tracheotomy is certainly indicated. Several weeks or even months may have to elapse before intubation can be safely resumed. Then, if the larynx has undergone cicatricial contraction, and it is the more likely to occur the nearer the wound is to the larynx, this contraction should be dilated with urethral sounds passed from below up, until a tube can be introduced as large as the larynx will bear without rupturing the cricoid, or, if this has been divided in the tracheotomy, without producing a slough. It may be impossible to fully dilate a cicatrix at one sitting, and in that case the tube should be increased in size as soon as the tissue has yielded, or in about ten days or two weeks. This tube, then, should not be disturbed for five

or six weeks. Then, whether the stenosis is dependent upon hypertrophied or cicatricial tissue, or whether it originally accompanied an intubation or not, at least marked improvement can be confidently expected. It is possible, however, that another five or six weeks may be needed to effect a cure. The metal tubes cannot be used, as they soon become roughened, and so may cause ulcerations, or even become clogged. The hard-rubber instrument is ideal, as it never becomes foul or loses its smoothness, and therefore can be carried for almost an indefinite length of time in the larynx.

I have always employed general anæsthesia whenever it was necessary to intubate or change the tube in these chronic cases, as I am not an expert in the operation and desired to have the patient perfectly quiet and ready for any contingencies. In skilled hands, however, this should not be required except when forcible and rapid dilatation has to be accomplished.

From the experience noted at the Foundling and Willard Parker Hospitals, there seems good reason to believe that, as the diphtheria antitoxin comes into earlier and more general use, the need of intubation for acute stenosis will gradually disappear. But for chronic laryngeal obstruction, nothing can take its place.

All honor to the name of Dr. Joseph O'Dwyer.

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A CONTRIBUTION TO THE SURGERY OF THE STOMACH, INCLUDING WOUNDS, GASTRO- TOMY, GASTRO-ENTEROSTOMY. AND GASTRECTOMY.¹

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IN this report will be included two cases of wound of the stomach, three cases of gastrotomy, two cases of gastro-enterostomy, and one case of gastrectomy.

WOUNDS OF THE STOMACH.

CASE I.—Special policeman, aged thirty-four years, was admitted to my service in the Norwegian Hospital, suffering with a bullet wound of the abdomen, the ball having entered just to the left of the ensiform cartilage. It was evident the man was suffering from internal hæmorrhage and that the ball had entered the abdominal cavity. As I was absent from the city, Dr. Edward Day Ferris, my assistant, operated. On opening the abdomen it was discovered that the bleeding had taken place from a wound in the anterior wall of the stomach. Exploration of the interior of the stomach with the finger introduced through the opening made by the bullet, revealed another opening in the posterior wall along the greater curvature near the pylorus. After suturing the opening in the anterior wall, the omentum with the transverse colon was raised and a slit made through the transverse mesocolon so as to reach the opening in the posterior wall of the stomach. This was easily found and sutured. Following the general direction of the ball, an opening was found in the upper and posterior wall of the colon at the hepatic flexure; this also was sutured. No point of exit from the colon could be found. The wounds in

¹ Read before the New York State Medical Society, January 31, 1900.

the stomach and intestine were closed by Lembert sutures of silk. After thoroughly cleansing the abdomen of blood-clots, the incision was closed by means of layer sutures. The patient rallied well, and until the fifth day nothing of note occurred. At this time the first symptoms of delirium tremens appeared and the patient became very violent. This continued for two days, when he died. At the autopsy the abdomen was found perfectly clean and no evidences of peritonitis present; all wounds had firmly united, but no trace of the ball could be found.

CASE II.—An Italian, twenty-eight years of age, was admitted to the hospital six hours after receiving a stab wound just to the left and above the umbilicus. The skin wound was only half an inch in length and was closed by a projecting plug of omentum. After thorough cleansing of the skin and of the omentum, this was returned and the finger introduced through the opening. This revealed a complete severing, transversely, of the left rectus muscle and an abdomen filled with blood-clots. A median incision was immediately made and an incised wound two inches long found in the anterior wall of the stomach. Exploration through this wound showed no perforation of the posterior wall of the stomach. The wound of the stomach was closed with silk sutures, the abdomen thoroughly cleansed of blood-clots and stomach contents which had escaped, drainage provided, and the abdominal incision closed. His general condition was very bad from the combined effects of the loss of blood and shock. Although vigorous stimulation and infusion were resorted to, he never rallied, and died twelve hours later.

While both of these cases died, it seems only fair to consider the first to have recovered from the operation, he having lived a week, and no abdominal conditions which would have caused death being found at the autopsy.

Gastrostomy, or the production of a gastric fistula, is designed to relieve the patient from the immediate suffering and dangers of starvation due to strictures of the cesophagus. These strictures may be spasmodic, cicatricial, or malignant, and may occur at any point in the cesophagus.

Spasmodic strictures of the cesophagus usually occur in nervous subjects, and are often easily overcome by the use of

graduated bougies. The literature would lead one to believe that they are always simple affairs and need little attention. That this is not true is proven by the occurrence of one fatal case, reported in the *Lancet* by Power, and by the following case, the history of which is here presented as prepared for me by her physician, Dr. J. Bion Bogart, of Brooklyn.

" Mrs. C., aged thirty-two years, is the third of five children, all of whom are dead except one brother, aged thirty. The others died at five, fourteen, and twenty-nine years respectively,—the first of scarlet fever, the second, a robust, well-developed girl, of some difficulty associated with the establishment of the menstrual function. She was ill but three days, and her mother believes her life might have been saved by an operation. The physician who attended her is dead, but the history strongly suggests some defect of development. Her oldest brother, who had been melancholy for five years previously, committed suicide. He was of a decidedly nervous temperament and believed himself ill, complaining, among other things, of dyspepsia. The surviving brother has also for some years been a sufferer from nervous and digestive disorders. Her father died at fifty-eight of nephritis, having always previously enjoyed good health except for a few months, about the age of thirty, when he too suffered from indigestion, induced, it was thought, by too close attention to business. His symptoms, however, were of brief duration and did not return after a summer's rest. His family were long lived, and none suffered from nervous or mental troubles or defects of development, as far as can be ascertained.

" Her mother, who also comes of a long-lived stock, is well at sixty, and her family history is likewise negative.

" The patient was a well-formed and healthy infant at birth, weighing about seven pounds. She was a nervous child, but enjoyed good health during infancy and childhood; and, although she was never robust, there were no symptoms referable to her present trouble until about the age of fifteen, when she first began to regurgitate fruit. This gradually extended to meat and other solids, until it came to pass that, at irregular intervals, she retained very little of what she ate for days together, followed by intervals of almost complete control over food of all sorts.

" Her appetite was uniformly good. Indeed, she may be

said to have been hungry all the time. Her digestion, also, was apparently perfect. At times, it is her belief that everything she ate passed directly into her stomach, while at others, although she had no difficulty in swallowing either fluids or solids, the food collected at some point between the pharynx and stomach to the amount of from half a pint to a pint, and would go no farther, but could be and was regurgitated at will at various intervals, varying from immediately to several days after she had eaten it. The latter part of this statement refers more particularly to large solid articles, particularly of meat, which were not infrequently retained until decomposition was well advanced, and which she had difficulty in bringing up because of their size. She could feel them rise to a certain point, at which they became obstructed and could be brought no farther at that effort. Thus, at times, a large piece of meat could not be dislodged for two or three days, while in the mean time she might have eaten and digested several full meals. The return of the food lodged in the œsophagus was not attended with any feeling of nausea or effort at vomiting. She appeared simply to open her mouth and the food flowed out. Oftentimes during a meal she would leave the table, regurgitate what she had eaten, and then return and eat as much more without any other feeling of discomfort than that occasioned by a feeling of fulness, which she always referred to the right of the sternum.

“Stimulants, especially champagne, seem to have been well absorbed from the œsophagus; but she appeared not to derive any other benefit from the taking of food into her œsophagus than the relief of thirst, which she frequently found very annoying.

“For some time after the difficulty in swallowing was first observed, she was able to force food into her stomach by muscular effort, her muscles of deglutition becoming powerfully developed, standing out in an unusual manner.

“Previous to her marriage, ten years ago, she consulted several eminent physicians, all of whom seem to have arrived at the conclusion that she suffered only from a spasmodic œsophageal stricture. About a year after her marriage she became pregnant, and seems to have suffered no inconvenience from that condition until the size of the uterus began to be a factor, after which her troubles increased rapidly, so little food passing into her stomach

that she was kept alive by rectal alimentation for some weeks, and was reduced almost to a skeleton. Her labor at term was brief, easy, and accompanied with comparatively little pain, occupying but three hours. Her child, a boy, although small, weighing with his clothing only about five pounds, was well nourished, and has grown up to be a strong, healthy, bright lad. His mother, who is of average height, is said to have weighed but seventy-two pounds a short time before or after his birth: I have been unable to determine which. Following the birth of her child she did not menstruate for a year, and at various times, both before and since, menstruation has been similarly suspended for several months.

" Her history since the birth of her child has been merely a repetition of her previous history, except that the periods during which she could take food in sufficient amount to fairly nourish her body gradually became less frequent and prolonged, and her demands for relief more urgent.

" She was first seen by me in February, 1895, when she had for some time suffered from one of her periodic attacks of regurgitation and defective nutrition. I made a diagnosis of spasmodic stricture with secondary œsophageal dilatation, and, after washing out her stomach and introducing a breakfast through a tube for several mornings, she gradually recovered better control of deglutition and went South, after which I did not see her again until the following autumn, when, at the request of Dr. Jacob Fuhs, I saw her with him in consultation. At this time the difficulty of introducing instruments into her stomach began to be manifest; but, after several attempts, we succeeded in introducing an olive-pointed bougie, thirty-five millimetres in circumference, attached to a whalebone shank, into her stomach by making steady pressure at the point of obstruction, about seventeen inches from the teeth. At the same time Dr. Fuhs found that food withdrawn by the stomach-tube, introduced down to but not through the stricture, showed no evidence of digestion and no pure hydrochloric acid, but, instead, the presence of both lactic and butyric acids; while a test meal, introduced into the stomach through a tube passed beyond the obstruction and afterwards withdrawn through a tube, also passed beyond the obstruction, was well digested, and contained free hydrochloric acid. A considerable cavity proximal to the stomach having been demonstrated, the only question left to be determined was whether we were dealing

with a dilated œsophagus or a diverticulum. Against the diverticulum were the absence of swelling about the neck, the large amount of food retained without entering the stomach, and the great depth at which the obstruction was met. We therefore concluded that we had to deal with an œsophageal dilatation and a stricture largely, if not wholly, spasmodic. Dilatation was recommended, but, owing to the discomfort entailed, was not persevered in long enough to determine whether it would be beneficial, and the patient passed out of our hands until January, 1899, when, because of a more serious and prolonged period of obstruction attended with increasing emaciation and weakness, Dr. Fuhs was again consulted; and, as the passage of the stomach-tube had now become exceedingly difficult and oftentimes altogether impossible, he was obliged to resort to rectal alimentation. After restoring her nutrition somewhat, Dr. Fuhs was kind enough to ask me to see the patient again, when, after a repetition of our previous investigations we had confirmed our diagnosis and again proposed dilatation of the stricture, we were met with a request for further consultation. At my suggestion, therefore, Dr. Abbe was asked to see the patient, and, in the presence of myself and Dr. Fuhs, passed several bougies of different sizes and patterns, presumably into the stomach, thus satisfying himself that no organic stricture existed, and leading him towards a probable diagnosis of a diverticulum; although, after several attempts, he was not successful in engaging a small œsophageal probe bent and twisted at various angles and curves. I then suggested an X-ray examination, which Dr. Abbe made at his office, using a solution of bismuth, of which the patient drank about half a pint, to distend the œsophagus and enable its outline to be photographed. Two exposures of about twenty minutes each were made on different occasions. They both showed approximately the same state of affairs; but, as only a portion of the bismuth solution was retained at the second séance, the first picture is the clearer. They were taken in the recumbent position, the patient lying upon her back with the plate under her. To the right of the spinal column is seen a shadow darker than the spinal shadow, but which gradually shades off into the latter. It consists of a vertical and a horizontal portion, making a rather abrupt turn from right to left at its lower extremity. The vertical portion tapers towards the top and the horizontal portion towards the left; the general shape being roughly fusiform with a rectangular turn. The extreme

length of the vertical portion of the shadow is about eight inches with an extreme width of three to three and a half inches, while the length of the horizontal portion is five inches with an extreme width of one and a half to two inches. It indicates, in our opinion, a dilated and elongated œsophagus, the upper portion of which lies partly in front of but mostly to the right of the spinal column, while the lower or horizontal portion rests upon the diaphragm.

“With the view of making the diagnosis still more positive, I made the following experiment, which was accomplished with great difficulty, owing to the fact that not only was the patient now unable to get any food into her stomach naturally, but the introduction of the tube had become very difficult and often impossible. Sometimes she could pass it herself at the first attempt; while at others, for two or three days in succession, it was absolutely impossible to introduce any sort of an instrument into her stomach, and she was at such times obliged to rely altogether upon rectal alimentation. A long tube could easily be passed its entire length into the œsophagus, but, instead of entering the stomach, would fold up in the dilated portion; and even bougies of medium flexibility could be passed several inches farther than normal without entering the stomach.

“On the afternoon on which the experiment was successfully carried out she succeeded in passing the tube immediately into the stomach at the first attempt, the point being at first twenty-nine and a half inches from the teeth; but during the washing out of the stomach it slipped back until it was but twenty-four and a half inches from the teeth. No doubt this was still farther than necessary, but I feared to withdraw it farther, lest it could not be replaced in case it slipped out altogether. The stomach appeared to be fully distended, and she complained of great pain when rather less than three glasses of warm water had been introduced through the tube. The usually contracted abdominal wall also appeared to be made tense by this amount of fluid, the distention being in the umbilical rather than the epigastric region, the latter appearing retracted by contrast. After introducing the water into her stomach, I first examined her in a reclining posture, the percussion dulness in that position extending about two inches above and about three inches below the level of the umbilicus. Afterwards I had her lie down flat, when, to my surprise, the tumefaction and dulness had disappeared, tympanitic resonance taking its place. The fluid undoubtedly passed at once

through the pylorus during the change of posture, for she at once took more fluid through the tube without discomfort. Almost immediately her face became flushed, and she complained bitterly of symptoms of cerebral congestion. Undoubtedly the thirsty glands rapidly absorbed the warm fluid. After thoroughly washing out the stomach, I introduced half a pint of blue fluid into it through the tube, and then had her drink an equal amount of red fluid, the tube remaining undisturbed in her stomach. I then siphoned out all the blue fluid, which came away untinged with red; and, having again washed out the stomach to remove all trace of the blue stain, I withdrew the tube until the point of it was fifteen and a half inches from the teeth, and siphoned out all the red fluid through the tube entirely untinged with blue. I then removed the tube altogether, and asked her to bring up whatever she could, with the result that, after several attempts, she regurgitated about half an ounce of stringy, red-stained mucus. I then asked her to drink another glass of warm water and again reject it. It all came back faintly tinged with red. There was absolutely no mixing of the fluids, and both were completely withdrawn through the tube as I have stated. This experiment proved to me conclusively the existence of two cavities, the lower of which was undoubtedly the stomach and the upper a dilated œsophagus, as a diverticulum could not have been entered by simply withdrawing the tube. It also showed the stomach to be very small and situated abnormally low, both of which conditions were subsequently verified at the time of operation, and which led me to add the following comment in reporting the result of my experiment to Dr. Abbe: 'I am inclined to think that it is not unlikely of congenital origin; the spasmodic element becoming prominent and beginning to cause trouble about the age of puberty, and constantly adding to the deformity.'

"The history of the case would not be complete without mention of the patient's intensely neurotic temperament, and of the fact that she has three, instead of two, floating ribs on each side, a discovery made by Dr. Fuhs, who also noted dulness on percussion to the right of the spinal column when the œsophagus was distended, and heard only the first deglutition sound when the patient swallowed fluids.

"The diagnosis having now been established beyond question, the relief of the obstruction to the free passage of food into the stomach still remained, now seriously complicated by the failure

of the patient's nutrition and the very great difficulty of introducing any sort of an instrument into the stomach. However, before resorting to a cutting operation, I determined to make a trial of a method of retrograde dilatation described by J. C. Russell in the *British Medical Journal* of June 4, 1898. The author relates six somewhat similar cases in which he was able to afford partial or complete relief by introducing a small hollow sound with a dilatable cylindrical extremity through the stricture into the stomach and withdrawing it after inflation.

"I therefore had made for me by Messrs. Tiemann & Co. an instrument consisting of a small-sized stomach-tube with a conical extremity, similar to the tube which the patient had recently had the best success in introducing, but with two passages, one terminating in the usual eye at the point and the other opening into an inflatable rubber cylinder, about three-quarters of an inch in diameter, which, commencing about an inch and a half from the point of the tube, enveloped it for about four inches upward.

"By means of this instrument it is possible to inflate the stomach or œsophagus with air so as to determine whether it has successfully passed the obstruction before inflating the bulb preparatory to withdrawing it with the purpose of dilating. While the success of this treatment still remained undecided,—several attempts to introduce the instrument on different occasions having resulted in failure,—I was taken ill, and Dr. Delatour, who succeeded me, was obliged to make an immediate gastrostomy to save the patient from starvation."

On April 2, 1899, at the request of Dr. Fuhs, I was asked to see the patient, owing to the illness of Dr. Bogart. I found the patient much emaciated, pulse 110, and temperature slightly subnormal. She had been unable to retain any food except by the rectum for a number of days, and now the rectum was becoming intolerant. Respiration was rapid and difficult, and percussion over the right chest behind revealed an area of dulness extending some three inches to the right from the spine. Auscultation gave a very feeble respiratory murmur over the lower right lung. After the very careful and prolonged efforts at diagnosis carried on by Drs. Bogart and Fuhs, and owing to the patient's low condition, I made no examination of the œsophagus, but accepted what unquestionably was the correct diagnosis. Immediate relief was necessary, and could only be given by a gastrostomy, which was performed by me the following day, April 3.

On opening the abdomen and examining the stomach it was discovered that the stomach was much diminished in size, and that there were between four and five inches of œsophagus below the diaphragm, with a correspondingly low position of the stomach. The question then arose whether to open the stomach for the purpose of examination of the œsophagus, but this was decided against. The operation was completed after the method of Ssbanajew-Frank, as will be fully described a little later. Reaction from the operation was rapid and free from nausea or distress. The following day the first food was introduced through a rubber catheter. It gave no pain and occasioned no distress, only two ounces of milk being given. From then on food was regularly given in larger quantities at intervals of four hours at first and later of six hours. No trouble was experienced in feeding for about six weeks, when the external opening began to contract. This was due to the development of keloid in the scar. This difficulty increased so much that in October I was compelled to dissect away a part of the scar tissue. This gave immediate relief, which was only temporary owing to a recurrence of the keloid. Again the tissue was dissected out, and the patient was put on thiosinamin, as recommended by Tousey. This was continued for six weeks and with marked benefit. At this time a soft-rubber bougie was introduced and retained in the fistula between feedings. This was to have the effect of continued pressure on the cicatrix.

Since the patient has been wearing this she has not suffered at the time of feeding. Leakage from the fistula occurs only occasionally, and then only in the morning, before the patient arises and when the stomach is empty. At the present time, January 31, 1900, she is in good general health, having gained much in flesh and strength. She goes about, to receptions, yachting, etc., and, but for the annoyance of feeding herself through the fistula and being conscious of her infirmity, is a well woman.

Cicatricial strictures result from the swallowing of caustics and from ulcers. In these cases we have a history of the injury or disease followed by a gradual or rapid increase of difficulty in swallowing. The natural tendency of these strictures is to contract, unless prevented by the use of bougies. In some cases there is developed in addition a spasm which at

times produces complete obstruction. Such a case came under my observation at the Long Island College Hospital.

A boy by mistake drank some caustic potash solution. In a few days difficulty in swallowing began, and in about two weeks became very marked. At the time of his admission to the hospital he was able to swallow liquids but very slowly; and occasionally there seemed to develop a spasm that completely closed the œsophagus, so that for a time, even a day or more, the child was unable to swallow anything. Attempts to pass dilators were unsuccessful; the bougie would not pass beyond the cricoid cartilage. The boy was rapidly losing flesh and strength, and it became necessary to immediately provide some method of feeding. The stricture was evidently high up and would demand an external œsophagotomy; but as it seemed that the general condition of the patient was none too good and feeding was the all-important object to be obtained, it was decided to first create a gastric fistula and then attend to the stricture. The operation of gastrostomy was done on September 23, 1899. The following day feeding through the fistula was begun by giving two ounces of milk every four hours, and then rapidly increasing the quantity until twelve ounces were given three times a day. To the milk have been added eggs, soups, and gruels. A special silver tube has been made to feed through; it is a straight No. 12 E. silver tube, two and one-half inches long, having a circular plate attached one inch from the top. To facilitate introduction, it is fitted with an obturator, the same as in a tracheotomy tube. After introduction the obturator is withdrawn, and the tube is connected to the feeding-funnel by means of a piece of rubber tubing. When the feeding is complete the silver canula is withdrawn. There is no leakage from this fistula at any time. Since the operation the boy has gained considerably in flesh and strength, and is now able to take larger quantities of food by mouth and also to swallow some semi-solid particles, such as crackers, bread, and potatoes. This improvement is probably due to the disappearance of the spasmodic element consequent upon the entire freedom from irritation during the two weeks when nothing was taken by mouth.

In both of these cases the question of retrograde dilatation was naturally considered. In the first case the condition of the patient did not warrant it, and the presence of the pouch

above the stricture, containing for a long time large quantities of decomposed food, forbade the making of a fresh wound or abrasion at that point. In the second case the stricture was so high that it was thought better to try further attempts at dilatation, and, failing in that, to directly attack the stricture through an external incision.

The Ssbanajew-Frank operation was performed in these cases. In this operation an incision two inches in length is made over the outer third of the left rectus beginning just below the costal arch. The fibres of the muscle are separated, not cut, and then the peritoneum is incised. Next a cone of the cardiac end of the stomach is drawn into the wound. At this time it is well to measure the length of stomach wall that is available for completing the second step of the operation. This consists in making a second incision about an inch above and a little to the outer side of the first through the skin and down to the rectus sheath. Then by a blunt instrument passed through the subcutaneous tissue the two openings are connected. The apex of the cone of stomach wall is now drawn through this subcutaneous channel and brought out at the second incision. Here it is fastened by one or two temporary sutures. Next the peritoneal coat of the stomach at the base of the cone is sutured to the peritoneal and fascial edges of the wound by four catgut sutures; the edges of the sheath of the rectus are now carefully adjusted, and the wound closed by a subcuticular suture of silk, and the line of incision painted with a mixture of collodion and aristol. Now the apex of the cone projecting through the second opening is incised and the stomach opened for about a quarter of an inch, and then by four or five silk sutures the mucous membrane of the stomach is attached to the margin of skin.

Carcinoma of the œsophagus may develop at any point, but is most frequently found near the cardiac orifice. In this condition, attempts to dilate the stricture should be avoided, as it is liable to produce hæmorrhage and hasten the development of the tumor. When swallowing becomes difficult, a gastric fistula should be established, as this tends to decrease

the rapidity of growth and to relieve the patient of a dreadful death due to starvation.

In a case of carcinoma of the cesophagus at the cardiac opening, occurring in my service at the Norwegian Hospital, a gastric fistula was established, following the same general plan as described above, but, owing to the contracted stomach, it was impossible to pass the cone through the subcutaneous tissue to the second opening. This made it necessary to suture the stomach to the edges of the original incision. This, of course, gave a straight fistula instead of an angular one. The result was not satisfactory, as considerable leakage from the fistula took place. The patient lived for six weeks, during which time he only received partial relief.

Obstructions at the *pylorus* may be due to either malignant or benign growths or to cicatricial contraction the result of ulcers. The symptoms in either case depend on the completeness of the obstruction. Pain is present to some degree in all cases, especially after the ingestion of food. Vomiting is more or less frequent, in some occurring after every meal and in others the food is retained for twenty-four to forty-eight hours after taking. It is then vomited in great quantity partly digested and decomposed. The presence of a tumor can be made out in many cases of malignant disease, especially where the patient is much emaciated. The failure to find a tumor, however, is not positive proof of its absence, for in a given case the tumor may be found at times, and not at others. This is especially true of small growths on the posterior wall of the stomach near the pylorus.

The operative procedures in pyloric stenosis must vary according to the nature and extent of the stricture. In simple cicatricial strictures, the Heinecke-Mikulicz operation of pyloroplasty may be done. This consists in making a longitudinal incision across the point of stricture, and then by suture converting it into a horizontal line. The operation of digital dilatation as proposed by Loreta is more dangerous, and gives less satisfactory results.

In carcinoma of the pylorus, the question is whether to remove the growth with more or less of the stomach, or to do

a palliative operation by diverting the flow of gastric contents from the stomach directly into the jejunum by the operation of gastro-enterostomy. The procedure to be adopted must depend on the character and extent of the growth. If the growth involves, besides the stomach, the liver, gall-bladder, or lymphatic glands, the complete removal of the entire tumor becomes an impossibility, and should not be attempted. In such a case the establishment of a union between the stomach wall and the duodenum or jejunum establishes a passage out of the stomach, and allows of the patient taking food and being nourished. Two such cases have come under my care.

The first, a Norwegian painter, forty-five years old, had suffered with severe gastric symptoms extending over eighteen months, during which time treatment for dyspepsia gave relief. On admission he was much reduced in flesh and so weak that he was confined to bed. Examination showed a distinct tumor in the region of the pylorus. Accordingly, on the 26th of February, the abdomen was opened by an incision extending from an inch below the ensiform cartilage for five inches. Exploration revealed a nodular tumor involving the pylorus and also the liver and mesenteric glands. Radical operation was decided against, and an anterior gastroduodenostomy after the method of Kocher was done. The reaction from the operation was prompt and unaccompanied by vomiting. Rectal feeding was employed for two days, and then small but increasing quantities of peptonized milk and beef peptones were given. His improvement was rapid, and on April 2 he was discharged from the hospital. He was able to return to his work as a painter and to continue at it for nearly a year. His strength then began to fail, and eighteen months from date of operation he died, exhausted by the disease. Certainly this was a palliative measure that proved very gratifying.

A second case treated in the same manner, although relieved of the pains and hunger, survived the operation only six weeks. In this case at times there would be a return flow of the intestinal contents into the stomach, with consequent vomiting. This, of course, interfered with the proper nourishment of the patient.

The Kocher operation attempts to join the intestine to the stomach in such a way that the direction of the onward

movement of the contents of the intestine will correspond with the flow in the stomach, *i.e.*, that the proximal portion of the intestine must be towards the left and the distal portion towards the right. It is also important that the contents of the stomach should be able readily to reach the distal portion of the intestine. Kocher describes the operation thus: "The intestine is placed at right angles to the stomach in such a way that the proximal portion of the loop ascends and the distal portion descends. The escape of the stomach contents into the distal portion is thereby greatly favored. The intestine is opened transversely upon its convex side, to the extent of almost half its circumference, and is sutured to the stomach in such a way that the proximal part of the loop lies directly upon the stomach while the distal part is free upon it. The distended distal part of the intestine can thus bring about compression of the proximal portion, but not *vice versa*. In order to still further insure that the contents of the stomach and proximal piece of intestine should pass on into the distal portion, an artificial valve is constructed by making a curved incision into the convexity of the intestine at some little distance from the stomach. The outer surface of the base of the flap is now sutured to the lower edge of the wound in the stomach, the edge of the flap itself being left free. The upper edge of the stomach wound is sutured to the lower and concave edge of the intestinal wound.

Where the *growth is entirely limited* to the stomach and there is no involvement of the lymphatic glands, either a pylor-ectomy or gastrectomy may be performed. Gastrectomy, proven to be possible in 1876 by Czerny, who operated on strong animals and showed that compensatory over-activity of the intestines might maintain life after complete removal of the stomach, was first successfully performed on the human subject in September, 1897, by Schlatter, of Zurich, who removed the entire stomach for cancer and united the cesophagus to the jejunum. This patient lived in comparative comfort for fourteen months, when she died of recurrence.

On February 24, 1898, Dr. Brigham, of San Francisco, removed the entire stomach from a woman sixty-five years of

age, for adenocarcinoma. The anastomosis was made between the duodenum and cesophagus by means of the Murphy button. Duration of operation was two and a quarter hours. This patient is still alive, and by means of the X-ray the button, which never came away, can be located in the epigastric region.

May 31, 1898, Dr. M. H. Richardson, of Boston, performed a similar operation on a woman fifty-three years of age. In this case the anastomosis was made between the cesophagus and duodenum by means of silk sutures. This patient made a good recovery, except for a fistula which developed and was some weeks in healing. In the following November this reopened, and shortly afterwards symptoms of intestinal obstruction appeared. The patient died February 19, 1899, nearly nine months after operation, from recurrent carcinoma. Several operators have reported similar operations, but none of the patients survived the operation for more than a few hours.

Total Gastrectomy for Carcinoma.—A case of adenocarcinoma of the stomach, limited apparently to this organ, came under my notice in April, 1898, and was operated by me on May 2, being the third gastrectomy successfully performed, antedating Richardson's case nearly one month. The history of this case is as follows:¹

Mrs. S., twenty-six years of age, a Norwegian, came to the hospital complaining of pain in the epigastric region and of a rapid loss of flesh and strength. Her dyspeptic symptoms began about the first of her pregnancy, a year before. Severe and persistent vomiting appeared early and continued after the delivery of the child. During the three months intervening between labor and her admission to the hospital, the vomiting became more persistent, and at the time of our examination was repeated within a few hours of the ingestion of any food. The patient was very anæmic and reduced almost to a skeleton. For nearly three weeks, she said, no food had been retained for any length of time. During this period she had been examined by a number of physicians, who had considered the case one of indigestion or gastritis. At our examination, a distinct tumor could be seen and felt along the

¹ New York Medical Record, Vol. lvii, No. 5.

free border of the right costal arch. The case was diagnosed as one of a new growth involving the pylorus and probably a carcinoma; operation was advised and gladly accepted, as the pain and distress were so severe. The operation, performed on May 2, 1898, was done as follows:

A median incision extending from the ensiform cartilage downward for four inches was carried through the skin, fascia, and peritoneum, and gave a free exposure of the tumor, which was seen to occupy the stomach wall from the pylorus to the œsophageal opening along the lesser curvature, and the greater curvature for nearly two-thirds of its extent. As the tumor was freely movable, and there was no evident involvement of contiguous structures, a gastrectomy was decided on. The pylorus was lifted into the wound and a clamp placed on the duodenum an inch from the limit of the growth. The next step was the freeing of the omental attachment along the greater curvature. This was done by tying off small sections at a time and introducing the finger behind so as to avoid ligature of the mesocolon, as happened in a case reported by Kocher. The entire greater curvature was freed, and then a similar succession of ligatures was placed along the lesser curvature as far as the œsophagus, and the attachments to the stomach severed with scissors. This left the stomach free, except for its attachment to the duodenum at one end and to the œsophagus at the other, and a small peritoneal attachment at the cardiac end. We next divided the intestine, and then made an oblique section through the stomach from the œsophagus to the cardia. This removed practically the entire stomach, only a small portion of the cardiac end remaining. The opening of the œsophageal portion was now closed with fine silk sutures, until it corresponded in size with the intestinal end. An end-to-end anastomosis was then made, interrupted sutures of fine silk being used. A small strip of iodoform gauze was introduced to the line of suture and brought out at the middle of the abdominal incision. This was closed with layer sutures of chromicized catgut. Duration of operation fifty minutes. Reaction from anæsthetic was prompt and little or no shock developed.

Rectal alimentation was carried on exclusively for five days. At this time the gauze drainage was removed and found to be unstained. Feeding by stomach was then begun with small quantities of peptonized milk and peptonoids, and, as these were so well borne, the quantity by stomach was rapidly increased with a

corresponding decrease of rectal food. Hunger now was the one symptom that troubled us. As the patient began to go about, she would eat anything she could get, and apparently without distress. Vomiting never occurred at any time after the operation. The tumor examined by Drs. J. M. Van Cott and A. Murray was pronounced an adenocarcinoma.

Her subsequent history was one of progressive improvement, a rapid gain of flesh and strength taking place, so that in the following fall, six months after operation, when exhibited before the Brooklyn Surgical Society, she had gained between thirty and forty pounds. A little over a year after the operation, she came to see me and informed me that she was three or four months pregnant, and wished to know whether the pregnancy should be terminated. As her general condition was so good at the time, I could see no indications for the performance of such an operation, and so advised her. She then moved from Brooklyn, and the next word I received of her condition came from the Rhode Island Hospital, Providence. She had been confined on December 31, 1899, giving birth to a healthy living child, and subsequent to that time there had been no movement of the bowels, and there was frequently repeated vomiting. I went to Providence, January 11, 1900, to see the patient, and found her suffering with a greatly distended abdomen, an inability to move the bowels, but no further nausea or vomiting, as rectal feeding had been resorted to. I saw the case with Dr. John T. Keefe, attending surgeon to the hospital, and after consultation it was decided to make an exploratory operation. To Dr. Keefe I am indebted for the privilege of having performed this second operation. An incision was made just to the left of the scar of the previous operation and the abdomen opened. This exposed an irregular nodular hard mass coming up from the region of the gall-bladder and involving the transverse colon. This was plainly a recurrence of the carcinoma, and it was perfectly evident that its removal could not be accomplished. The abdominal wound was then closed and the patient put to bed. She suffered no depression from the exploration. For a week she was fed entirely by rectum, and at the end of that time some liquid food was given by mouth without any return of vomiting.

Under date of January 31, 1900, Dr. Keefe writes: "Mrs. S. is doing well, wound healed, no nausea or vomiting, and she takes

small quantities of food by mouth. Some pain in abdomen, most marked at night."

A peculiar coincidence in this case was the development of severe symptoms at the termination of pregnancy with both the original and secondary growths. In the second instance, however, no vomiting or gastric disturbance appeared until the end of the pregnancy. On reflection, one naturally asks, Would this recurrence have taken place had pregnancy been terminated? This is a problem beyond me to solve.

With recurrence taking place in so large a proportion of these cases, Richardson¹ asks whether it is justifiable to submit patients to so radical an operation. After considerable discussion, he concludes that the mental and bodily suffering are less in those cases submitted to operation than in those refused it. He says, "I have seen not only the despair and suffering in the inoperable cases, but the suffering in those cases in which successful operation has been performed. The truth is, that the former greatly exceed the latter, and justify extensive operations when extensive operations are possible."

In the case here reported, it certainly seems that the operation was well worth the doing; for it has added at least twenty months of comfort and happiness to her life, and permitted the patient to give birth to a healthy living child.

NOTE.—Mrs. S. died February 11, 1900, twenty-one months after operation. The autopsy showed the small intestine to be distended to nearly the calibre of the large intestine. In the epigastrium was a mass involving the abdominal wall, duodenum, liver, gall-bladder, transverse colon, and right kidney. The opening at the point of suture of the duodenum and remnant of the stomach easily admitted the index-finger. At the junction of the ascending and transverse colon the disease narrowed the diameter of the gut to about one-fourth of an inch. About one hundred and fifty points of ulceration were found in the lower half of the ileum. One of these points had perforated, and this was probably the immediate cause of death, as there was present a general peritonitis, about one pint of intestinal contents being found free in the peritoneal cavity.

¹ Boston Medical and Surgical Journal, September 28, 1899.

REPORT OF A CASE OF RECOVERY AFTER LIGATION OF THE FIRST PORTION OF THE RIGHT SUBCLAVIAN ARTERY FOR ANEURISM OF THE THIRD PORTION.

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MRS. F. W., American, aged forty-four years, married. Referred to me by Dr. J. E. Best, of Arlington Heights, Ill. Family history, negative. Personal history, has had three children, the first two being twins. Of these one died at the age of three months, from cause unknown; the other at six years, of diphtheria. The third lived two weeks. Has not had any miscarriages or premature labors. Has had no illnesses excepting the ordinary diseases of childhood, and diphtheria at the age of nineteen. Denies having had venereal disease, although she has had treatment for some uterine trouble. Present illness began insidiously about nine months ago, without any known cause. She first noticed a feeling of numbness and tingling in the ring and little fingers of the right hand. After about three months she began to have cramp-like pains, referred principally to the inner side of the arm and forearm. This was soon followed by shooting and throbbing pains along the posterior surface of the arm and in the right shoulder immediately under the inferior angle of the scapula. These pains at first were paroxysmal in character, but lately have become nearly constant, so that her rest has been broken and her appetite impaired.

Examination shows a fairly well nourished individual with a somewhat rapid and irregular pulse. Just above the right clavicle in the subclavian triangle is a tumor, more prominent when the

patient is erect than when reclining. This tumor is somewhat smaller than a hen's egg, globular in shape, soft, and easily compressible.

On palpation a well-marked expansile pulsation synchronous with the systole of the heart can be felt. On auscultation a distinct bruit can be heard. The radial pulse on the right side is perceptibly slower and smaller than on the left side.

Operation, November 18, 1899, at the Chicago Policlinic Hospital, assisted by Drs. J. E. Best, F. S. Coolidge, and P. F. Morf.

A curved incision with the convexity downward was made beginning just above the suprasternal notch and ending externally about two centimetres above the deltoid tubercle of the clavicle, the lowest point being about three centimetres below the clavicle. A flap consisting of skin, platysma, and fascia was reflected, fully exposing the subclavian triangle and the origin of the sternomastoid muscle. This muscle, with the sternohyoid and sternothyroid, was divided transversely just above the clavicle, and the internal jugular vein and carotid artery exposed. The carotid artery, the pneumogastric and recurrent laryngeal nerves were retracted inward, while the internal jugular and innominate veins were retracted outward, exposing the lower part of the scalenus anticus muscle. Close to the inner edge of the scalenus anticus, but considerably deeper, the vertebral artery could be located. The thyroid axis was found three-eighths of an inch external to the vertebral. This was traced downward until the subclavian was reached. The sheath of the subclavian was incised for a distance of about one-half an inch just internal to the point of origin of the vertebral. An attempt was made to pass a ligature about the artery at this point. In doing so the posterior wall of the artery ruptured, giving rise to a profuse hæmorrhage, which completely hid the field of operation. Several attempts were made to pass the ligature, but as soon as pressure was removed from the artery the hæmorrhage recurred. This necessitated the ligature of the artery some distance below the point of rupture, which could not be accomplished without resection of the clavicle. Accordingly, the clavicle was divided about two inches from the sternoclavicular articulation, the sternoclavicular ligaments severed, and the clavicle reflected downward. This did not seem to materially improve the situation, so that the inner fragment of the clavicle was removed, and with it the upper angle of the sternum. This

gave ample room. The artery could now be exposed for a distance of about two inches from the internal border of the scalenus. All of the structures in relation with this portion of the vessel could easily be identified. Three catgut ligatures were quickly placed about the artery and tied: two of these being proximal and one distal to the point of rupture of the artery. The distal ligature had to be placed very close to the vertebral artery. The two ligatures proximal to the point of rupture were placed about three-quarters of an inch apart, and were tied so as to occlude the vessel, but not to rupture its coats. After the ligatures of the vessel had been completed and the operation wound sponged dry, the artery could be traced downward and backward for a distance of about three inches from the inner border of the scalenus anticus. In place of a common trunk from which the carotid and subclavian were given off, the latter seemed to pass behind the carotid and come directly from the arch of the aorta. No brachiocephalic trunk could be seen. The relation of the origin of the subclavian to that of the carotid could not be determined. The divided muscles were sutured and the wound closed without drainage.

The patient's temperature never rose above 99.5° F. The pulse, which had previous to the operation ranged from 118 to 130, gradually dropped to normal during the first ten days. The skin sutures were removed on the fifteenth day, when the wound was found healed by primary union. The patient complained some of the arm and hand feeling cold during the first two weeks. The pain in the arm and hand that was so annoying before the operation has completely disappeared. There is no radial pulse nor any return of pulsation in the aneurism up to the present time (seven weeks after the operation).

There are several points in connection with this case which I regard as worthy of consideration.

(1) The aneurism involved the entire third portion of the subclavian and encroached slightly upon the second portion, so that the only rational method of treatment was ligation of the first part.

(2) The anomalous position of the subclavian vein, which was found above the artery throughout its whole course. Owing to this position of the vein, it was torn while endeavor-

ing to retract it downward so as to reach the artery external to the internal jugular. As a result of this accident, a considerable amount of time was consumed before the hæmorrhage could be controlled by lateral ligation of the vein.

(3) The anomalous origin of the right subclavian and the unusual depth of this vessel were for a time very confusing.

(4) The possibility of having to resect the clavicle was considered before the operation. I had determined to ligate the vessel without, if possible. I now consider it a necessary step, and would strongly recommend preliminary resection of the clavicle and a portion of the sternum in all cases. In my opinion, it makes very little difference whether the portion of the clavicle which is resected is restored or not. In the case just reported the patient had an almost perfect clavicle at the end of six weeks, although the inner third, together with the upper end of the sternum, had been removed.

(5) The ligatures employed in this case were of formaldehyde catgut. The suggestion of Souchon, of applying two or three non-contiguous absorbable ligatures, should be followed in all cases. The ordinary surgeon's knot is all that is required. The ligatures should be drawn sufficiently tight to occlude the vessel, which can be determined by cessation of pulsation in the aneurism, and not tight enough to rupture the arterial wall.

(6) Probably the most important factor in securing favorable results in these cases is the preservation of an aseptic condition of the wound.

(7) As regards the results so far obtained in the ligation of the first portion of the right subclavian, this case is, I believe, the second on record where the patient survived the operation. The first case of recovery after ligation of the first portion of the right subclavian artery is probably that published by Curtis in the *ANNALS OF SURGERY*, April, 1898.

COMPLETE EXTERNAL DISLOCATION AT THE ELBOW.

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ON November 17, 1899, J. A. L., aged sixty-three years, a farmer living near Frederick, Md., was riding in a spring wagon, when the wheel sank into a rut, and he was thrown to the ground, falling on his right elbow. He got in the wagon again and drove to Frederick, and consulted two physicians, who attempted to remedy the injury to his elbow, but without success. On November 21 he entered the University Hospital, Baltimore, for treatment, and was assigned to my service. The patient was a small, spare man, whose intelligence did not appear to be great: at least he could give no satisfactory account of the injury beyond what has just been related. Upon admission, the right arm was much swollen and ecchymosed, and the configuration of the elbow was entirely obliterated. Pressure was very painful, and the bony parts could not be distinguished. The limb was flexed and somewhat pronated, and there was an absolute loss of the power of voluntary movement, whilst passive motion could only be effected to a limited degree. His temperature was 98° F., pulse 80, and respiration 20. As the swelling was too great to permit any effort being made to reduce what was evidently a dislocation, hot wet cloths were wrapped around the elbow and the patient kept in bed. The brawny cedema gradually subsided until the anatomical landmarks could be made out by deep pressure. There was a great increase in the breadth of the elbow, with a projection especially prominent upon its outer aspect. The cup-shaped depression on the head of the radius could be readily made out, and the radial head could be felt to rotate in pronation and supination.

The olecranon process could be felt to the outer side of the external condyle of the humerus, and the finger could be made to sink into the greater sigmoid cavity of the ulna. Both radius and ulna were partially rotated, the radius being somewhat in front of the ulna. The condyles and articular surfaces of the lower end of the humerus could be felt behind and to the inner side of the



FIG. 1.—Arm in extension.

radius and ulna, the epitrochlea being especially prominent. After the partial subsidence of the cedema, the contour of the elbow was quite characteristic, there being a great increase in the transverse diameter of the joint, with a marked projection externally and a corresponding depression on the inner side. The condition

was recognized to be a complete external dislocation of the forearm at the elbow, and an attempt was made to effect a reduction, under an anæsthetic, but without success.

I regret very much that a skiagraph had not been taken previous to attempting the reduction, as the manipulations were quite severe, and doubtless caused the erosion, to be noted, on the external aspect of the humerus.



FIG. 2.—Arm in flexion.

The X-ray picture herewith presented was taken by Dr. Henry Chandler, of Baltimore, and beautifully shows the condition. There is an absolute displacement of both bones of the forearm to the outer side, the radius is slightly anterior to the ulna, and the inner side of the coronoid process of the ulna is placed in front of and just below the external condyle of the

humerus, whilst the olecranon process is behind and above the condyle. The picture is taken from the front, with the forearm extended as much as possible. There is a loss of substance at the capitellum and external condyle, which was undoubtedly due to attrition during the efforts at reduction, as no sequestrum is shown in the picture, nor was any found at the operation. On December 7, 1899, twenty days after the infliction of the injury, he was again placed under chloroform, and a crucial incision was made on the back of the joint and the parts thoroughly exposed, the muscles separated from the external condyle and from the olecra-



FIG. 3.—Complete dislocation outward at elbow.

non process, and a further attempt made at reduction, which failed entirely until the triceps muscle was cut quite across, when the bones were made to resume their natural relations. The triceps was sutured and the extensive wound closed, except a small opening left for drainage, on account of the free oozing which occurred.

The triceps tendon was found displaced to the outer side, and attached normally to the olecranon process; the other muscles were also more or less out of their normal relations, but not torn. The ulnar nerve was found stretched, and was carefully held out of the way with a hook, but it was not injured; subsequently the

little finger and the inner side of the ring-finger remained anæsthetic for some time. Of course, all the ligaments of the joint were entirely ruptured. The radius retained its normal relation to the ulna, and the functions of pronation and supination were unimpaired. As has already been stated, the outer condyle was eroded, and some granular detritus was removed from the wound, but no sequestrum of any kind was found. The arm was put up in a slightly flexed position, and suspended. There was very little reaction following the operation, and the first dressing was made on the ninth day, when the sutures were removed, the limb exercised, and redressed in a right-angled flexion.

He left the hospital and returned home in four weeks from the time of the operation, with the limb in a useful position and a considerable range of passive motion, but without, as yet, much active motion, as there was still considerable œdema of the parts.

Owing to the anatomical complexity of the elbow-joint, complete lateral dislocations are of extreme rarity, and most surgeons have never seen an example of the injury. Stimson, in the edition of his work on "Fractures and Dislocations," published in 1899, gives the whole number of reported cases of complete dislocation outward as twenty-five. Three varieties of this location are mentioned:

(1) Directly outward, without rotation of the forearm.

(2) "Sub-epicondylar"; the elbow is flexed nearly or quite to a right angle and the forearm pronated; the radius is placed somewhat anteriorly to the ulnar, and the great sigmoid cavity is placed just below the external epicondyle.

(3) "Supra-epicondylar"; the forearm is flexed at, or nearly at, a right angle and pronated. The bones of the forearm occupy a position above the external epicondyle, hence there will probably be considerable shortening of the limb.

I regard the case here presented as belonging to the "sub-epicondylar" variety, slight shortening of the forearm, flexion, and partial pronation being present. My experience is limited to this one case, and I can give no suggestions in regard to treatment, except to attempt reduction as soon as possible after the injury, and, when it is impossible to secure reduction by manipulation, to proceed without delay with operative measures.

REPORT OF A CASE OF ACTINOMYCOSIS HOMINIS OF THE LUNGS.

By JAMES B. BULLITT, M.D.,

OF LOUISVILLE, KY.

THE subject of this report was a married woman, twenty-five years of age, who was sent to Louisville on November 5, 1899, from one of the smaller towns in the interior of Kentucky. She had been married two years; before that time she had always been fairly well, although of delicate build and small frame, her ordinary weight having been about 100 pounds. One healthy child was born ten months ago. She was in bed three weeks after confinement, and just about this time began to have pain in the region of the left shoulder-blade. This was quite severe, and was followed in a short time by cough and profuse expectoration. Then a swelling was noticed over the lower left aspect of thorax, and there was great pain in this region. The following history was furnished by the practitioner by whom she was sent to Louisville:

"She was first seen in March, 1899. A few weeks after the birth of her child she complained of pain in the left side just below the border of ribs. She was at that time noticeably anæmic. She had fever, cough at times with purulent expectoration, sometimes streaked with blood. At this time the right lung was believed to be free from disease, but there was some disturbance in the left lung. It was finally concluded that there was a collection of pus in the left side at the site of pain, and an incision was made over one of the lower ribs at the posterior lateral aspect of body, evacuating a quantity of pus. The rib was found roughened, and a curette was used to scrape the diseased bone. This was in May last. There has since remained a discharging sinus. Three or four weeks later another softened area became manifest; this was incised close to the first incision and curettement practised.

"Soon after this there was a considerable discharge of the

same kind of material from the bowel, and this has troubled her off and on ever since. There seems to be some connection between the two, as the sinuses discontinued to discharge when there was flow through the bowel, and when the bowel was quiescent the discharge from the sinuses seemed to be increased. On account of the great pain complained of, she was given large doses of opium and morphine. The diagnosis of general tuberculosis was made. *There was only one drug that seemed to have any effect, and that was iodide of potassium;* this was discontinued, however, because it injured her stomach too much."

The patient was admitted to the infirmary of the Louisville Medical College, November 5, and the following notes were made:

She is extremely emaciated, very white, and presents the general appearance of a patient in the last stages of tuberculosis. The buccal cavity and tongue are coated with little white patches, aphthous in character, and the result apparently of lack of mouth hygiene. There are three sinuses on the left lateral aspect of the body over the lower ribs. Expansion of the right side of the thorax is markedly diminished. The right lower thorax is distinctly prominent, the swelling corresponding to the position of the liver and the lower portion of the right lung, and most prominent in the anterior axillary line. The skin over this swelling is slightly reddened, and over the seventh rib in the nipple line fluctuation is perceived over the space of about one and one-half by three-quarters of an inch. Discomfort and pain are complained of in the abdomen, but no tumefaction or nodulation can be felt. While expectoration is at times quite profuse, practically no abnormal sounds are to be heard on auscultation over either right or left lung; but on the right side, especially at the lower portion of the lung, the respiratory sound is suppressed. On squeezing some pus out of one of the sinuses above referred to, and scrutinizing it, it is observed to be mucoid in appearance, white with a slightly yellowish cast, and in it are innumerable granules, some as large as the head of a pin, others quite minute.

On account of the presence of these "sulphur granules" the provisional diagnosis of actinomycosis was made. Microscopic examination confirmed the diagnosis, the clubbed ends of the ray fungus being very plain without staining; afterwards Gram's method of staining demonstrated the actinomycotic threads. Ex-

amination of the sputum showed the presence of the "sulphur granules."

The extreme condition of the patient and the extensive nature of the process precluded the possibility of surgical interference; the administration of iodide of potash was therefore begun, together with constructives.

The patient has always lived in the country, and since her marriage, two years ago, on a farm of about one hundred acres; they had a small number of horses and about sixteen head of cattle. She has done her house-work, but has not milked the cows or otherwise come in contact with horses or cattle. She disclaims the habit of chewing pieces of straw, or grain of any kind. There is no appearance of infection about the mouth, jaws, or neck. From the history, it would seem probable that the infection was primarily of the left lung and occurred by aspiration along the bronchi.

November 25.—Since her arrival at the infirmary there has been a diarrhœa, from two to twelve stools in twenty-four hours. They are watery and contain undigested food, mucus, and small streaks of blood. A close examination has failed so far to demonstrate the presence of "sulphur granules" in them.

The nurse has noticed that since the patient has been at the infirmary she has kept both thighs flexed on the pelvis. On questioning the husband, he says before she became bedridden she was unable to stretch her legs out fully; that this inability was first noticed in the left limb three or four months ago, and some weeks later it became manifest in the right limb.

November 26.—The patient gradually sank and died to-day. Post-mortem examination was immediately made. On removing the sternum, the right lung is found adherent to the wall laterally along the lower half and posteriorly its whole length. The left lung is free on its lateral aspect, but adherent posteriorly and at the apex anteriorly. The pericardial sac is distended with clear serum. The heart is small and flabby. On passing a sponge over the diaphragm behind the left lung to remove the fluid present, there come away, as adhesions are broken up, some fibrino-gelatinous masses and strings, red in color. On breaking up the adhesions of the right lung, pus begins to exude from the parietal wall from the sinuses which connect with the external swelling which has already been described. The adhesions of both lungs pos-

teriorly are dense, and, as they are broken up, the hand is felt to slip into spaces filled with soft, broken-down tissue. On the right side the lung is adherent to the diaphragm. The abdominal cavity now being opened, the liver is found small, smooth, and without adhesions, uninvaded. The spleen is as yet uninvaded; but where adherent to the abdominal wall postero-laterally the process has just reached its capsule. The stomach, the kidneys, the bladder, the uterus, the ovaries and tubes appear normal and unaffected. There is no indication of involvement of the appendix and caecal region, nor of the small and large intestine. The diaphragm is seen to be involved in the process on the left side posteriorly, and was torn through in the attempt to separate the lung from the diaphragm.

The disease process continues downward from the lungs and connects with the sinuses on the left lower posterior aspect of the thorax already mentioned. After removal of the thoracic viscera, the diaphragm, and the liver, the process is seen to involve the left side of the posterior aspect of the thoracic wall over an area of seven by three inches, beginning above at the eighth rib and extending down to the twelfth. The ribs and vertebræ are bared and roughened. Purulent material can be milked up from the sheath of the psoas muscle. Quite a mass occupies the area along the psoas muscle to the left of the spinal column, running down to the sacro-iliac synchondrosis and then following the sheath of the psoas muscle into the iliac fossa, the course of this extension being very like that of tubercular psoas abscess so frequently encountered. The second lumbar vertebra is eroded on the left side. A similar condition exists in the region of the psoas muscle on the right side, only not quite so extensive and not extending into the iliac fossa. The thoracic wall on the right side is involved over an area of four by two and one-half inches, from the fourth to the seventh rib, corresponding to the swelling noted over the lower portion of the right thorax.

Careful inspection of the intestine, which is removed and slit up its entire length, fails to disclose any lesion appearing to be actinomycotic in character. The mucous membrane of the rectum and colon is congested, and there are two small areas of ulceration through the mucous membrane down to the muscular layer in the cæcum just above the ileocaecal valve. One of these is about the size of a three-cent piece, and the other three-fourths of an inch

long by one-fourth of an inch wide. These ulcers have smooth edges.

Careful inspection of the mouth, jaws, and neck fails to disclose any lesion due to the actinomyces.

The heart and lungs were preserved by the Kaiserling process, and were sent to Professor Flexner, of the University of Pennsylvania, for examination. His pathological report is appended.

PATHOLOGICAL REPORT BY PROFESSOR FLEXNER.

The specimen consists of the heart and lungs. The heart is small, the pericardial surfaces are smooth. The mitral and tricuspid valves are normal.

Left Lung.—The upper lobe shows over the middle-anterior portion old adhesions. On the lower surface, next to the lower lobe, there are similar adhesions. The upper lobe is somewhat compressed, but on section it is generally air-containing. The lower lobe is more voluminous, excepting over the lower third. The pleura is quite smooth. This lobe is opaque, its color grayish, and it presents a semi-translucent aspect. On section, very little evidence of air can be obtained. The surface is singularly homogeneous and translucent. The consistence is markedly increased. Over the lower third of the lung the pleura is covered by old adhesions represented by tags of tissue, and by fresh fibrinous exudate. This exudate surrounds and demarcates two foci of consolidation of yellowish color, over which the pleura is more or less deficient. Here occur losses of substance corresponding with cup-shaped depressions. The larger defect occurs at the inferior-posterior border of the lung; it measures four centimetres in circumference, and extends backward to the attachment of the aorta. The neighboring lymph-glands which abut upon this focus are pigmented, but not otherwise altered. The smaller area occurs along the mid-inferior edge of the lung. It is about two centimetres in diameter. The section of both of these is quite similar, showing the involved lung tissue to be firm, and of a variegated yellow-gray appearance. In the larger there is considerable new formation of fibrous tissue, which has brought about contraction and the cup-shaped depression already mentioned. It is especially about the small area that the pleura is covered with fibrin, and small hæmorrhages have taken place in

this membrane. An old fibrous adhesion with the diaphragm binds this portion of the lung to that structure.

The Right Lung.—The several lobes are indistinguishable upon the surface. The whole structure measures sixteen by seven centimetres. The anterior half is compressed, but is still air-containing. The lower third of the mid-posterior border of the lung is occupied by circular masses measuring six and one-half centimetres in diameter. The pleura over this area is thickened, partly by fibrinous tissue and partly by fresher fibrinous exudate. There is a central irregular area, partly depressed, over which the pleura is gone; and a defect has taken place, the tag-like appearance of which indicates adhesion to the thoracic wall. The surface of this area is variegated, reddish brown, gray, and yellow, and about the deficiency there is a rim-like elevation, and thickening of the pleura. Above this, extending to the apex of the lung, there is a line of coagulated blood, faintly adherent to the pleura; whereas, posteriorly, involving the posterior half, and extending to the root of the lung, the pleura is covered by shaggy fibrinous membrane, two or three millimetres in thickness, which lies upon a dense fibrous layer of about equal thickness. A section carried along the median edge, through the solid mass described, reaching to the bronchi at the root of the lung, shows, imperfectly marked, the line of demarcation between the lobes. The upper portion of this section corresponds to the section along the anterior portion of the lung, whereas the lower portion takes in the lower lobe, in which the solid mass is situated. This lobe is firm, grayish-pink in color, and almost free from air. The solid mass itself is included in this thickened, solid lung, but is firmer than the surrounding tissue, and shows a yellowish-gray surface, which is much variegated. A section carried along the posterior border, within four centimetres of the root of the lung, shows the entire lung tissue, from apex to base, gray, semi-translucent, and almost free from air. Old adhesions, which exist between the posterior border and the surrounding tissues, including lymph-glands at the root of the lung, seem to be free from the peculiar, yellowish material composing the mass within the lung. On the other hand, on the left of the thoracic portion of the artery there is a firm mass of tissue measuring four centimetres in diameter, which on section shows a pinkish-gray variegation. It would appear as though it might represent an adhesion to the circular mass, at the inferior-

posterior edge of the lung which has been described. There is no invasion of the thoracic portion of the aorta.

HISTOLOGICAL DESCRIPTION (HEMATOXYLIN AND EOSIN, EOSIN AND GENTIAN VIOLET).

(1) *Specimen from Right Lobe in the Neighborhood of Larger Bronchi.*—The section includes a large bronchus and adjacent blood-vessels surrounded by lung tissue.

The main bronchus has intact epithelium. In the lumen there is a purulent exudate with desquamating bronchial epithelium. In the exudate are several actinomycotic *Drusen* (rosettes). These are immediately surrounded by pus-cells. They show characteristic felting of the filaments and the swollen, bulbous ends. At one end there is a somewhat more diffuse network of filaments, the swollen peripheries being absent. The lung tissue itself contains several small abscesses, in the centres of which many actinomycotic rosettes are contained. These are closely surrounded with pus-cells, the structure of the lung in this situation being lost. In their immediate periphery the lung tissue is the seat of an active proliferation of tissue cells and a moderate infiltration with leucocytes. At a somewhat farther distance the alveolar structure of the lung is more evident, although the framework is here also infiltrated with leucocytes and proliferated cells.

The smaller bronchi in this section contain pus-cells, which frequently quite close their lumen. The epithelium behaves variably: sometimes it is intact, and at other times it has partially or completely disappeared. In the neighborhood of the main bronchus and blood-vessels, there is a focus of the thickened lung tissue, in which irregular spaces lined with cubical epithelium exist. These areas resemble the so-called proliferated bronchial glands described by Friedlander. They are probably modified alveoli of the lung, the result of chronic fibroid induration.

This specimen, stained especially for the demonstration of the parasite, shows, besides typical *Drusen*, scattered and isolated filaments which lie especially in the diffuse exudation.

(2) *Section of the Sclerotic Portion, a little Distance removed from the Larger Bronchus and including the thickened Pleura.*—The portion corresponding with the thickened pleura consists of a fibroid tissue adjacent to the lung, to which is at-

tached the underlying, voluntary intercostal muscle. In the thickened pleural tissues there are scattered masses of gold and yellow hæmatoiden pigment. The lung tissue proper shows much fibrous thickening with obscuration, or obliteration of the typical framework of the lung. In this thickened tissue there are abscesses, within which actinomyces rosettes are contained, surrounded immediately by pus-cells; while the more peripheral portion of the exudate contains proliferated tissue cells. The bronchi uniformly contain pus, and the smaller ones have lost, in part, their epithelial covering, from which denuded areas the surrounding tissue is being invaded with pus-cells.

(3) *Section of the Upper Lobe.*—It is free from focal lesion. The lung tissue is condensed. The alveoli are compressed, and in parts of the lung proliferation has taken place in their walls, with the production of fibroid tissue. In certain alveoli, which have escaped this thickening, there are fibrin, pus-cells, and desquamated epithelium cells. The bronchi generally contain pus-cells. The epithelium is in places absent, the surrounding lung tissue becoming invaded with leucocytes from this source. There are no large masses of the parasite in this section, nor, upon close examination, are there separated filaments, such as were present in the tissue near the bronchus, nor other pyogenic micro-organisms, discoverable.

(4) *Fibrinous Mass beside the Aorta on the Left Side.*—This mass consists of dense, fibrous tissue, containing masses of small round cells and of leucocytes in which are circumscribed accumulations of leucocytes forming small abscesses, in the interior of which the actinomyces bodies occur. That this mass was originally connected with the lung is shown by the persistence of epithelial structures resembling alveoli with cubical epithelium.

The microscopical examination confirms the diagnosis, and is of interest in showing several pathological conditions due to the streptothrix actinomyces.

First.—Where the typical rosettes occur the lung tissue is infiltrated with pus. Frequently this accumulation becomes so thick that the framework of the lung becomes indistinguishable, and, moreover, may actually break down and produce abscesses. The rosettes occur in the substance of the lung and in the bronchi, whence they appear in the sputa.

Second.—In the more diffusely infiltrated lung tissue the

rosettes, or *Drusen*, are absent, and single threads, or fragments of threads only, can be made out. These are irregularly scattered and are free from bulbous ends. Here, too, the lung tissue shows no sign of breaking down, but only diffuse cellular infiltration.

Third.—In the immediate neighborhood of the *Drusen* there is very little or no tendency to the formation of new tissue; the process is chiefly suppurative. At a distance from these and in the neighborhood of the separated filaments, or, indeed, where no filaments can be made out certainly, in addition to the moderate cellular infiltration there is also new formation of fibrous tissue thickening and obliterating the alveoli and causing changes (cubical growth) in the epithelium.

Fourth.—Besides cells, fibrin also is present in certain alveoli and upon the pleura; search for other organisms—pyogenic cocci—was negative.

We must conclude, therefore, that the actinomyces organism is capable of causing (*a*) suppuration; (*b*) diffuse cellular infiltration and fibrinous exudation; (*c*) fibrous-tissue formation.

Fifth.—The invasion of the bronchi has caused purulent bronchitis. In the smaller bronchi the epithelial lining has been denuded, and an invasion of the walls with pus-cells, which finally find their way into the parenchyma of the lung, is taking place. It is therefore quite possible that the pneumonia is always bronchial and secondary to invasion by the parasites from the bronchi.

In view of the exhaustive review of actinomycosis, especially in America, which has recently appeared in the ANNALS OF SURGERY from the pen of John Rühlrah, M.D., of Baltimore, it is deemed expedient here to do no more than plainly report the above case.

REPORT OF A CASE OF SUPERFICIAL BILATERAL GANGRENE WITH ASYMMETRICAL LESIONS.

By GEORGE F. WILSON, M.D.,

OF PORTLAND, OREGON,

SURGEON TO THE GOOD SAMARITAN HOSPITAL.

THE unusual features of the following case made it seem worthy of publication.

Miss A. C., a twin, of healthy parentage, came under my immediate care in February, 1898. Although not particularly robust, she had never been sick before. The menstrual function was not established until the age of eighteen, but there have never been any indications of pelvic disturbance.

In April, 1897, she fell down a flight of stairs, and scratched herself on the inner side of the right thigh.

The fall was not accompanied by any special disturbance of the nervous system, such as fright or shock, and would not have left any impression on her mind, except that a few nights later she was awakened by a severe pain in her leg, and on examination she discovered a black spot in the skin. She immediately placed herself under treatment, entering a hospital, where she remained about three months, during which time several other spots appeared on the same leg. Though attempting to work during the following months, there was practically no change in her condition up to the time she came under my care, ten months after the commencement of her trouble.

Before having this disturbance, she says, occasionally during the day she would be seized with an irresistible drowsiness, falling asleep on one occasion while eating.

Examination showed a well-nourished young woman, with no discoverable lesion of any important organ. Urine normal.

On the anterior surface of the right lower extremity were three or more scars, and the same number of granulation areas, as shown by the photographs, and a patch of gangrenous skin on the ankle.

Mixed treatment, with increasing doses of iodide of potassium, was given, adhesive straps applied to the ulcers, and a charcoal poultice to the slough. The slough separated in a few days, and improvement in every way continued satisfactory until the twenty-eighth of the month, when she became very nervous, lost all appetite, and suffered such violent cramps in the abdomen as to require an opiate. In addition to this there was a sensation of numbness in the right leg, with pains shooting down into the foot, and a feeling as if the entire limb were swollen. Occasional sensations of cold were complained of.

Examination of the leg after the dressings were removed showed a black gangrenous patch of skin over the patella, and another over the tibia about its middle. The necrotic process did not at this time involve the entire thickness of the skin, nor has it ever done so since; consequently there has never been any contraction after the part is healed.

From this date, February 28, 1898, to February 23, 1899, there were thirty-one attacks, which were almost identical in symptoms with the one which I have endeavored to describe.

The only interval between of any duration was one of forty-four days, from July 25 to September 7; but there were five more attacks before the end of the latter month, though this may have been caused remotely by an operation. The abdominal pain, with at times nausea, vomiting, and hiccough, were the most constant precursory symptoms, to be followed within twelve hours by the skin lesions.

On account of the scars and alteration in color from previous attacks, I never was able to demonstrate any blanching or redness preceding the necrosis, and failed absolutely, on one occasion, in an attempt to predict by any change of appearance where the breaking down would occur.

The actual attack seemed to be an outcrop of vesicles, which gradually coalesced, followed in a short time by a change of color due to the actual death of the tissue. The urine was examined many times, and there never was any transient albuminuria or hæmoglobinuria, such as is occasionally observed in Raynaud's dis-

ease. An hysterical element was present, as evidenced by a contracture at the ankle and a marked tendency to attract attention to her unfortunate condition.

On one occasion, the temperature, which had always been normal, suddenly assumed a very erratic curve, but dropped back to normal when the nurse was instructed to remain at the bedside while the thermometer was under the arm.

I am of the opinion that the rise of temperature was apparent, and that the change was due to friction of the bulb against the blankets.

On a subsequent occasion, some weeks after the amputation, she announced to me that she was sure the other leg was going to break down, as it was all covered with blisters. This may have been an abortive attack, but it was the only one of its kind; and its artificial appearance led me to protect it with a plaster-of-Paris bandage, which treatment resulted in a cure.

Close observation of the attacks over a period of many months excludes absolutely the possibility of the trouble being due to extraneous causes.

In the way of treatment of the case, careful inquiry elicited the fact that she had taken large doses of the iodide of potassium before, so the mixed treatment was soon abandoned.

Then nutritive tonics and nervous sedatives were given a fair trial, after which, following the suggestion of Haig as to the uric acid causation of the condition, a strictly non-meat diet was adhered to, and alkalies with salicylate of soda administered with absolutely no result. Following this electricity was employed, and nitroglycerin given, in increasing doses, until quite severe pain in the head was complained of.



It was during the use of the nitroglycerine that she had the longest immunity from an attack, and her general condition was so much more satisfactory that I determined to save any unnecessary drain on her resources by the use of skin-grafts on the unhealed ulcers.

While under the anæsthetic, a very thorough examination was made of the pelvic contents, with the view of excluding any possible reflex irritation.

No abnormality was discovered, and there was no connection between the attacks and her menstrual periods.

The skin-grafts all did well, but ten days later a spot appeared at the site of an old ulcer, and in rapid succession, at intervals of about a week, all the new skin lost its vitality.

The process was not confined to the limits of the grafts, but extended beyond at different points, thus showing no difference in resisting power between the old and new skin.

On December 26, 1899, at the suggestion of my friend, Dr. A. C. Panton, that the peripheral nervous supply to the part might be at fault, and that stretching of the anterior crural nerve might therefore prove of benefit, I exposed that nerve through a longitudinal incision. I determined to go farther, however, and cut off any perverted trophic or other influence by a resection of its cutaneous branches. More than an inch of the internal cutaneous and internal saphenous nerves was removed, and somewhat less of the middle cutaneous after it had passed through the sartorius, as it was seen to supply that muscle.

The wound healed primarily, and the operation caused no discomfort except a tingling sensation in the leg, but accomplished nothing, as another attack occurred eleven days later, followed by others at short intervals.

By this time, having had no encouragement from all previous efforts in her behalf, and there being no prospect, remote or otherwise, of spontaneous relief, I began to consider the propriety of an amputation, which was being strenuously urged by herself and relatives.

I could not understand how the gastric symptoms could be relieved by such an operation, but as the patient was now in a wretched condition, requiring increasing doses of morphine, I decided to remove the limb.

This was done at the hip-joint by Wyeth's method on March

17, 1899, two years, lacking one month, from the onset of the trouble.

The wound at its outer angle was slow in healing, but otherwise her convalescence was uninterrupted.

The morphine was gradually withdrawn; she ate and slept well, gained considerably in flesh, and continued practically well until June 25, 1899, when a slough appeared on the left thigh, followed in a few days by another over the patella and a small one on the stump.

At short intervals others appeared below the knee, on the outer side of the thigh, and on August 3 a large superficial one appeared on the front of the abdomen, the only one thus far on the trunk. I saw the patient a few days since, and while her general condition was very good, she reports that on December 24 she suffered an attack which resulted in a large patch on the front of the tibia, covering an area greater than the palm of my hand.

Nothing apparently has been gained thus far by any plan of treatment, though since the amputation there seems to be a longer period between the attacks.

I regret, too, that I have been unable to furnish any light on the pathology of the condition, except to demonstrate that it is surely of central origin.

DISLOCATION AT THE SHOULDER COMPLICATED BY FRACTURE THROUGH THE ANATOMICAL NECK OF THE HUMERUS.

BY CHARLES BROOKS BRIGHAM, M.D.,

OF SAN FRANCISCO.

C. E. E., aged thirty-four years. On the 18th of July, 1899, at Jamestown, Cal., the patient, who is a physician, was thrown violently from his buggy in a runaway, the vehicle colliding with an electric-light post and the patient falling heavily on his left hand, the palm of which was badly scraped.

On examination by a local surgeon a dislocation of the left shoulder was found and reduced under chloroform; the arm was placed in the usual bandage. There was, however, a continuous pain the entire length of the arm, more at the lower part of the deltoid muscle, though not infrequently a sharp pain extended to the tips of the fingers. The lower part of the deltoid was quite painful to the slightest touch; elevation of the arm unassisted was impossible.

The condition of continuous pain and disability induced the patient to seek further advice, and he came to me in the early part of December, nearly five months after the accident.

Externally, the left shoulder presented a depression of three-quarters of an inch in width and two and a half in length just below the acromion. On rotating the arm, the head of the bone was apparently felt in the glenoid cavity, and on pushing the humerus upward and outward the roundness of either shoulder was nearly the same; with the finger in the axilla a bone representing a part of a sphere could be felt, not loose, but connected with the humerus near the inner tuberosity; this bone moved with the humerus on rotation. The amount of shortening was one inch.

The diagnosis was a fracture of the anatomical neck of the humerus. In the efforts of reduction the broken piece of bone had become detached after the dislocation and left outside the capsule in the axilla. The pressure of the bone in its new position was a source of irritation to the circumflex and musculo-spiral nerves, and accounted for the pain in the lower part of the deltoid as well as in the entire limb. The radiograph confirmed the diagnosis.

The removal of the bone from the axilla was advised, and on the twelfth of December, at St. Luke's Hospital, an incision of four inches was made along the inner border of the pectoralis major; after the division of the axillary fascia the bone was felt and brought nearer the surface by abducting the arm; care was taken not to divide or injure any nerves; but one vein of medium size was tied and divided. A flat periostome carefully separated the neck of bone which united the head with the humerus; it was impossible to find the exact point of union on examining the fractured bone after removal, so evenly rough was the surface; it was the length of the index-finger from the incision, that is, about three inches deep. The wound was sutured and a drainage-tube placed.

The recovery was rapid; after a few days the drainage-tube was removed and a fresh dressing applied; there was an oozing of a yellowish fluid, probably synovial, for a week longer, when the wound healed.

The patient returned home on the twenty-first of December; the immediate cessation of pain in the arm, which had been continuous for five months, was the most notable result of the operation. The ability to raise the arm was in a great measure restored.

The patient writes, January 12, 1900, "For the last ten days I have not experienced any pain whatever; the limits of motion are very much more than before the operation, and the manipulation of the arm does not cause pain as before. I can also sleep on the side without any inconvenience, which I could not do before. I feel satisfied that I shall get at least 75 per cent. of the normal function of the arm."

I have not been able to find the history of a parallel case in any of the surgical works at my disposal. Follin, in speak-

ing of fractures of the anatomical neck of the humerus, says, "Sometimes the head after being broken off is thrown outside into the axilla through the capsule." ("Traité de Pathologie Externe," Vol. iii, p. 865.) He does not refer, however, to any particular case.

It is interesting to note how the fractured bone survived



FIG. 2.—The fragment removed.

for so long a period in the axilla with the slight connection it had with the main shaft.

The radiograph shows the fractured head of the humerus below the glenoid cavity. The rounded portion of bone at the tuberosities and under the acromion shows the efforts nature has made to restore a useful joint. The photographs of the head of the humerus speak for themselves; they are the exact size of the original.



FIG. 1.—Fracture through the anatomical neck of the humerus, with displacement of fragment down into axilla.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, December 27, 1899.

The President, B. FARQUHAR CURTIS, M.D., in the Chair.

DE LORME'S OPERATION FOR EMPYEMA.

DR. OTTO G. T. KILIANI presented a girl, nine years old, who was admitted to the German Hospital on June 27, 1899, with the following history: She contracted pneumonia of the right side on January 1, 1898, and two weeks later developed a pleurisy of the right side, for which she was tapped on February 15, 1898, a quart and one-half of fluid being evacuated. On March 1, 1898, a thoracotomy was done by the family physician between the sixth and seventh ribs, when a large amount of pus was voided.

The patient first came under Dr. Kiliani's observation on July 1, 1899. She was then much emaciated and in a very low condition, with all the symptoms of a total empyema of one side, cyanosis, short breathing, etc. A hasty operation, without narcosis, was immediately undertaken,—the seventh, eighth, and ninth ribs being resected, and about two quarts of stinking pus evacuated. Towards the hilus the lung was found to be completely compressed, resembling in shape a small, flat cake. Two drainage-tubes were inserted and the wound was dressed. There was no subsequent irrigation. The child recuperated favorably, and by November 9 she had gained fifteen pounds in weight. No tubercle bacilli were found in the discharge, which had become comparatively slight. The cavity existing occupied practically the whole right thorax.

As an ultimate recovery under the existing conditions was out of the question, a final operative attempt to close the cavity was proposed and accepted by the child's mother. Dr. Kiliani said he first intended to do a Schede-Estlander operation, but, because of the deformity it produces and its comparatively high

death-rate, he finally concluded to try De Lorme's method, although he did not expect at the time that the lung would expand again, after a compression of twenty months.

Operation, November 9, 1899. A trap-door-flap incision was made over the sixth and seventh ribs, reaching from the posterior axillary line to the mammillary line, and the flap was turned forward. An incision was then made through the pseudopleural membrane covering of the lung, and the membrane partly pushed, partly torn from its adhesions to this organ. Immediately after the incision the lung began to expand, and, as it was liberated, it gradually bulged out more and more. In removing the adherent pleura, the lung was unavoidably quite severely lacerated, and this produced rather an annoying hemorrhage through the nose and mouth. The flap was drawn back into place and a tube inserted through the lower angle of the wound. The child made a good recovery, and was dismissed from the hospital seventeen days later, November 26, 1899. The fistula closed on December 10.

Dr. Kiliani said that the expansion of the lung in this case, after a compression of about twenty months' duration, was a surprise to him, as well as the apparent recovery of the patient. At present, auscultation and percussion show that the lung has completely expanded to the chest-wall. The right chest is of course smaller than the left, owing to the marked degree of scoliosis.

DR. ROBERT H. M. DAWBARN said he noted that Dr. Kiliani, in spite of the large amount of pus evacuated and its offensive character, did not wash out the cavity. He asked on what grounds Dr. Kiliani took this stand. Personally, he regarded it as a wise one; and he referred to one case coming under his observation where he thought the patient's death was attributable to washing out the empyemic cavity. In the case he had in mind more than a quart of pus was evacuated, and its odor was so offensive that he decided to wash out the cavity with a one-half per cent. warm carbolic acid solution. Before the washing was completed, the man began to go into collapse, and he shortly died. Since the occurrence of this accident, Dr. Dawbarn said, he has never washed out these cavities until a number of days have elapsed, and then only if the discharge continues freely.

DR. KILIANI replied that, while acting as assistant to Schede, he was instructed never to wash out an empyemic cavity. Schede would occasionally wash out the cavity once, but never in the

course of the after-treatment. De Lorme advises washing out the cavity with an antiseptic solution two days before the operation. In his case, Dr. Kiliani said, he had given instructions that this should be done; but the assistant reported that he had to desist, as it caused severe coughing and dangerous symptoms of suffocation and collapse. The speaker said that at the time of the operation he made an attempt to wash out the cavity in the beginning of the narcosis, but it immediately brought on a severe fit of coughing, and he desisted.

Dr. Kiliani said he did not state that his case was not tubercular: he simply said that tubercle bacilli were not found in the discharge. This fact was not surprising in such old-standing cases.

The speaker said that in treating the resulting scoliosis he first proposed to try a corset, and if this failed, he would try forced extension and possibly bending of the entire thorax to one side.

The Schede-Estlander operation has a high death-rate, and is, at the very best, a badly maiming operation. Besides, it puts and keeps the compressed lung out of use forever; while De Lorme's ingenious operation is comparatively a simple operation, connected with very little or no danger, and restores practically normal physiological conditions. If the results should turn out to be as good as in this case,—and the reports so far seem to indicate this,—there can be no doubt that De Lorme's operation will supersede Schede-Estlander's for all cases of chronic empyema.

EXTENSIVE THORACOPLASTY.

DR. LUCIUS W. HOTCHKISS presented a man, twenty-four years old, a member of the Thirteenth United States Infantry, who, at the battle of San Juan, in July, 1898, was struck by a Mauser bullet, which, after perforating the left arm, entered the chest just to the left of the cardiac apex and emerged behind the right shoulder. The man was exposed for several days after the battle, and then brought down to the hospital at Siboney, where it was found that an empyema had developed. This was incised and a small rubber tube put in for drainage.

Subsequently, July 26, the patient was brought to New York on the transport Seneca, and admitted to Bellevue Hospital late in July. At that time his general condition was very bad; he was

much emaciated, had numerous bed-sores, and a badly drained empyema of the left chest, the lung on that side having collapsed. As soon as possible, July 28, Dr. Hotchkiss enlarged the original opening in the chest, excising one or two pieces of rib, made a counter-opening posteriorly, and put in some large drainage-tubes. These drained the cavity fairly well, and the man gained considerably in health and strength. Later on, August 26, the collapsed lung having failed to expand, an extensive operation was decided on in order to obliterate, if possible, the large pus cavity on that side of the chest, which contained between one and two quarts of fluid and could contract no further, and to rescue the patient from his septic condition. The procedure which was followed was along the lines of the Schede-Estlander operation. The incision extended from the second rib in front, thence down to the seventh, along which it ran around the body and up to a corresponding point posteriorly; this large flap was then raised and a portion of the third, fourth, fifth, sixth, and seventh ribs excised, together with the costal pleura. The man's condition was such as to demand very rapid work, and the transfusion of large quantities of normal salt solution. The flap, which consisted of skin and muscle, had been allowed to sink in against the collapsed lung. By this operation the cavity had been so reduced in size that it contained only a few ounces of fluid. The patient rapidly gained in flesh and strength and was soon able to be up and about the ward. At the time of his discharge from Bellevue, January, 1899, a sinus remained, which led into a cavity containing about six or eight ounces of fluid. In March he entered the Hood-Wright Hospital for the purpose of having this smaller cavity obliterated, as the sinus had become occluded and he was suffering from pain and fever. This second operation was done in March, 1899. A curved incision was made, commencing just below the left nipple, and extending backward to and along the posterior edge of the scapula, the muscles being partially divided. The scapula was retracted from the side of the chest in order to gain access to that part of the chest cavity. Upon raising the scapula, the ribs, which had been partially removed at the previous operation, were more widely excised still farther back, and the tissues covering them were allowed to sink in. Only the upper three ribs—the third, fourth, and fifth—were excised, as the lower part of the chest cavity had already been obliterated at the previous operation.

There was some infection of the wound following this operation, and a severe secondary hæmorrhage from one of the intercostal arteries.

Dr. Hotchkiss said that in June, 1899, when he had shown this patient at a meeting of the Bellevue Alumni Society, a small sinus still remained, which discharged a little pus. At that time there was considerable resonance over the upper portion of the left chest, showing that the upper part of the lung on that side was expanded. The lower portion of the lung was collapsed, retracted, and bound down by adhesions. Since then the improvement in the man's condition has continued, and the sinus has entirely closed. There is no scoliosis in spite of the extensive rib resection, and the functions of the arm are but very slightly impaired. The scapula moves freely and arm can be elevated above the horizontal plane.

Dr. Willy Meyer referred to a modified Schede operation which he did about eight years ago with the advice and help of Dr. Lange. Instead of resecting the flap entirely, as Dr. Hotchkiss did, the ribs were removed from their periosteal shells. A number of short resections and incisions are made through the ribs, anteriorly or posteriorly, and through these incisions the periosteum is loosened and the ribs drawn out. In the case he referred to, he removed six or seven ribs in this way. The patient, a young man of seventeen, died in about thirty hours after the operation, apparently of sepsis. Unfortunately, post-mortem was refused.

This operation, Dr. Meyer thought, was simpler and less difficult than to remove a complete muscle and bone-flap. It seemed worthy of a more frequent trial.

Dr. Kiliانى said that a similar procedure was used as far back as 1890 by Schede, who made an incision anteriorly, and through this caught the rib, twisted and articulated it.

Dr. Dawbarn mentioned the operation of Subbotin, a Russian surgeon, who makes short incisions over the ribs along the anterior and posterior axillary line, and, as each rib is reached, it is simply divided subperiosteally, and this entire flap, composed of bone, muscle, and skin, is allowed to sink in; this, with the aid of drainage, permits the parietal and visceral pleura to come together. It is worthy of more frequent usage.

ORBITAL FRACTURE WITH SINUS INVOLVEMENT.

DR. ROBERT H. M. DAWBARN presented a young man who had been admitted to the City Hospital on August 15, 1899. He had been struck in the eye by a splintered wagon-pole and rendered unconscious. For some weeks he was treated in the eye wards of the hospital. There was continuous suppuration, and with the probe it was ultimately made out that the orbit was involved.

Dr. Dawbarn first saw the patient on September 15, and discovered a fracture of the roof of the orbit, with extensive suppuration. He also found that the probe entered the frontal sinus. The patient refused operation until October 12, when he returned to the hospital with his eye in a much worse condition. An iridocyclitis had developed, with posterior synechiæ, and loss of the eye was threatened.

A free incision revealed an extensive fracture of the orbit; six or seven pieces of bone were removed, involving a good part of the roof of the orbit and communicating with the frontal sinus, which was completely filled with granulations; these were scraped away with a curved spoon. The question of draining the sinus through the nose then came up. The speaker said that about twelve years ago, after a series of experiments on the cadaver, he had found it possible in almost all cases, by means of a probe, peculiarly curved, to pass a thread from the frontal sinus, by way of the infundibulum and middle meatus, and out of the nostril. To this a fenestrated soft rubber tube is attached and drawn into place. Following this method, a tube was introduced for drainage, and the man made an uneventful recovery.

A considerable number of years ago, Professor G. R. Fowler, in writing up this topic (*Frontal Sinus Disease*) for Wood's "Reference Handbook," introduced a wood-cut illustrating Dr. Dawbarn's method. This is a distinct advance over the usual method described in the text-books, of crushing a passage from the sinus down into the nose, through the delicate bony structures, for drainage.

COMPOUND COMMUNUTED FRACTURE OF THE
FRONTAL BONE, INVOLVING BOTH FRON-
TAL SINUSES AND ORBITAL
PLATES.

DR. F. W. MURRAY presented a man, forty-eight years old, who was admitted, September 3, 1899, to the New York Hospital. The previous night, the patient, while very drunk, slipped and fell, striking his forehead on the sharp pickets of an iron fence. Two of the pickets had evidently penetrated the frontal sinuses, and, from a friend's account, the accident was followed by the loss of a large amount of blood. On admission, the patient was still intoxicated, was noisy and restless; temperature, 104° F.; pulse, 130; respiration, 28. There were three small superficial scalp wounds over the vertex and a lacerated wound of the upper lip. Skin over the forehead swollen and discolored, left eyelids swollen and contused. Over each frontal sinus was a lacerated wound of circular shape and about one-third of an inch in diameter; the situation of each wound was about half an inch from the median line and about the same distance above the orbital margin. Pressure revealed fracture of the underlying bone, and on introducing a probe through the wound it passed backward about one and a quarter inches. Well-marked left subconjunctival ecchymosis, left nostril firmly plugged with blood-clot. During the examination patient vomited, bringing up a large quantity of dark blood-clots; examination of pharynx revealed no signs of posterior nasal hæmorrhage. Wounds cleansed, antiseptic dressings applied, sedatives and free catharsis ordered. September 4 the wound over left frontal sinus was enlarged upward for an inch and downward to the root of the nose. Flaps retracted, front wall of sinus found comminuted, several pieces of bone removed. It was then seen that the fracture extended through the orbital margin and involved the roof of the orbit, which was also comminuted. Inner half of orbital margin removed in one piece: also several loose pieces of the roof of the orbit, almost half of the entire roof of the orbit. The frontal sinus was unusually large, and the portion of the orbital plate removed formed the floor of the sinus. Posterior wall of the sinus was seen to be not injured. Several of the anterior ethmoidal cells were found loose and were removed.

During the removal, air frequently escaped externally through the wound. Wound over right frontal sinus was similarly enlarged, and about the same amount of bone was removed; but on this side the anterior ethmoidal cells had escaped injury. Twenty-four pieces of bone in all were removed; the largest fragment consisted of the inner half of left orbital arch, together with a portion of the anterior wall and floor of the sinus. A few sutures were taken in the wounds, each sinus packed with iodoform gauze and sterile dressings applied. Patient stood the operation well, and was returned to the ward in satisfactory condition. During the following four days he became more restless and noisy; very delirious at night; at times tore off the dressings, so that on the 8th it was necessary to tie him down in bed. During this period the temperature ranged from 102° to 104° F., pulse 88 to 100, and, owing to an aggravated alcoholic gastritis, nourishment was given by the rectum. For the next ten days he was still restless and delirious, the pulse and temperature were lower, and food was retained by the stomach. On September 18 his hands were untied; his mental condition was somewhat improved; he was quieter, but the delirium at night continued for some time. Great complaint was made of severe frontal headache, which lasted for several weeks. On October 7 the wounds were entirely healed, and a few days later the patient was up in a chair. November 2 he was discharged cured. He now complains of slight headache at times. The wounds were packed in the beginning with iodoform gauze, then with gauze strips soaked in balsam of Peru, and towards the end gauze strips wrung out in ichthyol were used. Since his discharge from the hospital, he has returned to work, and is now as well as ever. Recovery after such an extensive fracture is due to the fact that the cranial cavity escaped injury owing to the very large size of the frontal sinuses. The cause of the cerebral symptoms was either alcohol,—as the patient had been a hard drinker for years,—or else concussion and laceration of the brain due to the fall. Dr. Pearce Bailey, who saw the patient several times after the operation, inclined to the latter cause. It was not septic meningitis, as the wounds healed promptly and without the slightest evidence of suppuration. Owing to the large size of the sinuses, it was deemed wiser to leave the wounds open and to pack them, and thus to allow them to become obliterated by the formation of granulations. Perhaps

the wounds might have healed as satisfactorily if a drainage-tube had been passed into the nasal cavity; but the chances of sepsis would have been greater.

Stated Meeting, January 10, 1900.

The President, B. FARQUHAR CURTIS, M.D., in the Chair.

PANCREATIC FISTULA.

DR. HOWARD LILIENTHAL presented a woman, thirty-four years old, who first came under his observation in July, 1899. She stated that nine years before she had had a tumor removed from the right axilla by Dr. Gerster. No detailed history of that operation could be obtained; but it was learned that the tumor removed at that time was supposed to be benign in character.

The woman's present illness, so far as she knew, dated from the birth of her last child, eight months before she came to the hospital; possibly it dated still farther back, as she stated that the pressure symptoms during her pregnancy were very marked. After her confinement, she was told that she had a movable right kidney; but the tumor in the abdomen of which she complained began to increase in size rather rapidly, and became tender to the touch. About three weeks before Dr. Lilienthal first saw her, it began to be slightly noticeable through her clothing. There were no urinary nor gastric symptoms. The patient complained of a burning sensation and some pulsation in the tumor.

When the woman was admitted to the hospital, her functions were practically normal and her general condition was good. She had a slight bronchitis. The spleen was normal in size; there was no heart murmur. In the abdomen, to the right of the umbilicus, there was a mass as large as two fists, hard to the touch, moving on respiration, and quite easily movable from side to side. It could be pushed upward, but could not be made to disappear under the ribs because of its size. The mass did not give rise to much pain, but it interfered somewhat with respiration. Dr. Gerster examined the patient at this time, and thought it probable that the neoplasm was connected with the right kidney, and this, Dr. Lilienthal said, was also his opinion. July 12, 1899, an incision through the right flank was made. On palpation through the wound the right kidney was found to be movable, but it was in

no way connected with the tumor, which was anterior to the kidney and covered by peritoneum. The wound was thereupon enlarged and the peritoneum opened. The tumor was found to be strongly adherent to the intestines, and it had a pedicle which ran upward to the head of the pancreas. In order to shell it out, it was necessary to resect the last rib. Anteriorly, it was found to be covered by two layers of peritoneum; its pedicle led directly up to the head of the pancreas, and it was also adherent to the side of that organ. After resecting a portion of the pancreas, the tumor was removed. In taking it out, it had to be peeled from a large vein, probably the portal. Its pedicle was tied off close to the head of the pancreas with heavy catgut. The wound was closed with dry dressing. There was considerable shock and reaction after the operation, and three days later the temperature rose to 102° F., and the patient was very restless; there was considerable cough and the urine contained white cells and hyaline casts. On the fifth day, after a dose of calomel and an ox-gall enema, the patient had a movement of the bowels. There was some nausea, which was checked by washing out the stomach. There was also a good deal of pain in the region of the stomach, for the relief of which an ice-bag was applied. About this time a distinct mass was felt in the abdomen below the wound, and Dr. Lilienthal said he feared that septic infection had occurred in the enormous space which had necessarily been left. An aspirating-needle was inserted, and with this a drop or two of pus was withdrawn. In reopening the wound a coil of intestine was evidently punctured, as the patient developed a fecal fistula which communicated with the abscess. A fistula remained, which soon began to discharge a large quantity of pancreatic fluid, together with feces.

Subsequent to this, the patient's general condition became worse. She was unable to digest her food until, upon the advice of Dr. Morris Manges, she was given pancreatic extract by the mouth, together with bicarbonate of soda, with very good results. Methylene blue, injected through the rectum, did not discolor the fistulous discharge, but subsequently, after a water enemata, the water was discharged through the wound.

With the idea in view of having the pancreatic fistula empty into the bowels instead of externally, Dr. Lilienthal said he removed the drainage-tube. From this time on, all discharge, both fecal and pancreatic, ceased, and when the woman left the hos-

pital on August 16 her wound had entirely healed, with the exception of a few superficial granulating areas. The tumor removed was submitted to the hospital's pathologist, Dr. F. S. Mandlebaum, who pronounced it a pure fibroma. He had thought that there was some possibility that it belonged to the class of wandering uterine fibroids, but its location made this assumption practically untenable; besides, it was directly connected with the pancreas. The fluid discharged through the fistula was pronounced pancreatic fluid.

The patient was readmitted to the hospital on November 4. An examination at this time showed a hard, board-like tumor occupying almost the same location as the previous one. Because of the unequivocal report of the pathologist, a recurrence was considered out of the question, and Dr. Lilienthal said he was inclined to regard the mass as a collection of pancreatic fluid surrounded by adhesions. He reopened the wound in the region of the cicatrix and found a large cavity completely filled with limpid pancreatic fluid. A drainage-tube was inserted, which is still in place and discharges freely. In order to save the skin from the extremely irritating action of the fluid, a urinal was attached to the drainage-tube. The communication which once existed between the pancreas and bowel has become closed, and the woman now has a pure pancreatic fistula, which discharges a large quantity of fluid daily; recently, the fluid contained some small calcareous masses.

DR. ALEXANDER B. JOHNSON said that, for Dr. Lilienthal's encouragement, he wished to say that during the past few years he had seen three pancreatic fistulæ following cysts of the pancreas which closed spontaneously. In one case the fistula had existed for nearly two years before it closed; during all that time the patient wore a drainage-tube, and the sinus gradually became smaller and smaller until a mere pinhole opening remained, which finally closed. In the other two cases the sinus remained open for six and eight months, respectively, both finally closing spontaneously and remaining closed.

In one of the cases the discharge was so free that the patient had to wear a large absorbent dressing, which he changed several times daily. There was certainly more than a pint of fluid discharged daily. When the dressings were changed, the fluid would escape freely over the abdomen.

DR. CHARLES L. GIBSON said he had under observation for some time a case of pancreatic fistula operated upon by a colleague which has been discharging freely for eight months without in any way interfering with the nutrition of the patient. The discharge is gradually decreasing.

The speaker said he was interested in the statement made by Dr. Lilienthal, that previous to the operation in this case he thought he had to deal with a lesion of the right kidney, and made his incision accordingly. In two instances, Dr. Gibson said, he had made the same mistake. In one, instead of a floating kidney, he found an enlarged gall-bladder with gall-stones which could be pushed down into the flank. The operation was, however, readily completed through the original incision, an ideal cholecystotomy being performed. In the other, he found a tongue-shaped prolongation of the liver which he recognized before going so far as opening the peritoneum: palpating this mass gave one the exact impression of a kidney.

DR. JOHN B. WALKER said that some years ago Dr. Bull operated on a case of pancreatic cyst, and a fistula resulted which remained open for about a year. On the day before its final closure it discharged very freely; before going to bed, the man applied the usual dressing, and the next morning he found that the fistula had closed spontaneously.

In a case operated on by Halsted, of Baltimore, a fistula remained open for fifteen months, and in one of Kelly's cases for about a year. Both closed spontaneously.

DR. LILIENTHAL rejoined that the cases cited by Dr. Johnson and the other speakers certainly gave him grounds for encouragement. In reply to a question, the speaker said that the ingestion of food did not seem to have any effect upon the amount of the discharge; the flow does not seem to vary to any extent, night or day. It gives rise to more discomfort at night, because then the patient is in the recumbent position and is more apt to wet and irritate the skin. The salicin test was not tried. The fluid, however, was examined by a pathologist, who pronounced it to be unquestionably pancreatic fluid. No free fat was found in the feces.

EPITHELIOMA OF THE LIP.

DR. B. FARQUHAR CURTIS presented a man, eighty-five years old, from whose lower lip an epithelioma had been removed by

Dr. Curtis six years ago. The tumor was small in size, but the scar which still remained showed that a pretty wide incision was made. At the same time, the space underneath the chin was exposed, but no disease was found in the lymphatics of that region. The man had remained perfectly free from recurrence.

DR. JOHNSON said the text-books on surgery contained numerous illustrations of plastic operations on the lower lip, but only in a very small minority of these is any provision made for a new vermilion border. The operation usually advised replaces the tissue which has been removed by a new lip which is rigid and ugly, having no red border. Such an operation is to be condemned, because the cosmetic effect is bad and the patient is always uncomfortable.

Dr. Johnson said he had shown several cases of epithelioma of the lip in which he had done Malgaigne's operation, or a modification of it; and he had often wondered why this operation, which is an excellent one, was not more generally spoken of. The speaker said that the only book in which he had seen Malgaigne's operation described was in Stimson's work on operative surgery.

SUCCESSFUL LIGATION OF THE INNOMINATE ARTERY.

DR. B. FARQUHAR CURTIS presented a man, fifty-five years of age, who for some months had had pain in his right arm, and would not use it when he was admitted to St. Luke's Hospital in November. Examination revealed an hypertrophied heart, with double murmur over the aortic valve and systolic at apex. All arteries enlarged and hard, especially the subclavian and axillary. Under the right clavicle was a swelling apparently two inches in diameter, corresponding to the subclavian artery, which pulsated with the heart contractions, giving a true expansile pulsation. A loud systolic bruit was present over the tumor. Deep pressure over the first part of the subclavian arrested the pulsation. The right axillary artery was also enlarged.

The carotids were but little altered, and there was no increased pulsation over the first part of the subclavian. Two weeks in bed, heavy doses of potassium iodide, and limited diet and drink, much improved the arteries and moderated the heart's action. The potassium iodide was then stopped for a week, without return of the very forcible pulsation.

December 2, 1899, under ether anesthesia, assisted by Dr. F. H. Markoe, the manubrium sterni was split in the middle line, following Milton's suggestion, which was then modified by dividing the bone transversely just above the second rib. The two halves could then be separated for two inches. A large artery was exposed and supposed to be the innominate, and a ligature passed around it. Pressure upon the vessel in the loop of the ligature with the finger arrested pulsation in the carotid, but not in the aneurism, proving that it was the carotid immensely dilated; the ligature was not tied. Drawing this vessel aside, the subclavian was discovered external and posterior to it. The first part of that vessel was also much dilated, both it and the lower part of the carotid were fully an inch in diameter. The vessels were followed down to the innominate, which was between one and a quarter and one and a half inches in diameter, but its walls appeared healthy. This vessel was then isolated and a double, heavy chromicized catgut ligature passed around it by means of a heavy pedicle needle shaped like an iliac aneurism needle. Pressure in the loop controlled both carotid and subclavian circulation. The two threads were laid side by side so as to make flat pressure, but were tied simultaneously and not according to Ballance and Edmunds's directions, for the artery was so large and tense that it was feared the catgut would break if tied singly. While tying the knot, the artery was folded in on itself smoothly by pressure of a blunt instrument in the loop, so as to avoid crumpling up the wall, and the knot was drawn only tight enough to arrest pulsation, and not so as to cut the internal coat. This ligature was placed about three-quarters of an inch below the bifurcation. Another ligature of the same size, but single, was passed through the same opening behind the artery, but tied obliquely, so that in front it lay about a quarter of an inch distally from the first. The coats were not cut by this ligature either, but it was pulled a little tighter than the first. The intention had been to slip it along distally so as to have it lie parallel to the first, but it was concluded best not to separate the vessel any farther from its sheath. The ligature on the carotid was then withdrawn. The view of the vessels was perfect and the dissection easy. The pleura was easily pushed aside unharmed, and no nerves or large veins were in the way. Ligatures were applied to two or three veins passing upward towards the thyroid. The bone was replaced and the two

halves united with a couple of silver wires. The wound was closed without drainage, except a little at the lower angle between the skin and the bone, as the latter was oozing vigorously; this was removed in twenty-four hours. The wound healed by primary union, except a couple of drops of pus in the skin at the upper angle which required opening the skin there slightly.

There was pulsation visible in the aneurism from the first, and a faint pulse could be felt in the radial in three or four days. These signs have grown less instead of stronger. The circulation in the fingers was never very bad; it was poor even before operation. A systolic venous pulse was observed in the exterior jugular vein after the ligation, and continues; also a faint pulsation running up apparently over the right internal mammary artery, which soon disappeared.

There was high fever (101° to 102° F.) for nearly a week, for which no cause could be found, and it disappeared spontaneously. There were no cerebral symptoms whatever.

DR. LILIENTHAL suggested that a distinction should be made between those cases of ligation of the innominate artery by this method and those done in former years, where the coats of the artery were probably cut through. The speaker thought that the more improved technique of recent years would yield a larger percentage of recoveries.

DR. CURTIS rejoined that he had no doubt that the operation of ligation of the innominate artery by modern methods had a future before it. He said he had recently heard that a Philadelphia surgeon had succeeded in ligating the abdominal aorta. In the case reported by Burrell, the innominate was tied by a double silk ligature drawn so tight as to cut the inner coat. The patient died of other causes 104 days later; and at the autopsy it was found that the ligature nearer the heart had made its way completely through the coats of the artery and lay inside the lumen of the vessel. The distal ligature had remained intact, and there had never been any hæmorrhage. In nearly all the fatal cases, death was due to secondary sepsis.

DR. ELLSWORTH ELIOT, JR., inquired whether there had been any difficulty in pushing aside the pleura, or if the operation would have been rendered much more difficult by a preceding pleurisy, with adhesions of the pleura.

DR. CURTIS replied that the pleura came into view, but it was

pushed aside without any trouble. Of course, the possibility of injuring it should be kept in mind; but he had found it perfectly feasible to pass the finger down behind the sternum and then divide the bone with the chisel. He did not think a pre-existing pleurisy would have made any difference.

EPITHELIOMA OF THE LIP.

DR. A. B. JOHNSON presented a middle-aged man who came under observation a little more than three years ago with an extensive epithelioma of the lower lip. The growth, which had existed for a number of months, had ulcerated, and involved considerably more than one-half the lip. The right side was more involved than the left, and some of the glands on that side were enlarged. The method of operation pursued was that of Malgaigne. The case was regarded as rather an unfavorable one for a radical cure. A very extensive incision was made, and almost the entire lower lip removed, together with the affected glands. Mucous membrane from the interior of the cheek was utilized for the purpose of making a new vermillion border, and the cosmetic effect was very satisfactory. The patient left the hospital on the eleventh day. Apparently, there has been no recurrence up to the present time, and the new lower lip was so mobile that the patient was even able to whistle.

DOUBLE COXA VARA.

DR. ROYAL WHITMAN presented a girl, eight years of age, who presented the appearances of typical coxa vara of both hips, —the waddling gait, the elevated and prominent trochanters, and the irregular restriction of the range of motion. The right leg was one inch shorter than the left, and it was adducted about ten degrees, while a slight range of abduction remained on the right side.

The case was of interest because the deformity was apparently of traumatic origin. Three years before, the child had fallen from a second-story window and had received an injury to the left hip. She was unable to walk for six weeks. Since then she had continued to limp upon that side. On this account, and because of the increasing difficulty in locomotion, she had been brought for treatment. This was undoubtedly a case of

fracture of the neck of the left femur; the etiology of the slighter deformity on the left side was less evident.

The treatment in a patient of this age should be the immediate correction of deformity. A wedge of bone should be removed from the base of the trochanter on either side, and the contracted tissues should be either stretched or divided. Thus the limitation of abduction might be overcome and the deformity of the bone remedied.

This method of treatment is described in the *ANNALS OF SURGERY* for February, 1900.

INTERSCAPULO-THORACIC AMPUTATION FOR OSTEOMYELITIS OF THE HUMERUS.

DR. GEORGE R. FOWLER read a paper with this title, for which see *ANNALS OF SURGERY*, June, 1900.

DR. CURTIS said he thought the suggestion made by Dr. Fowler, that it would be preferable, in cases of this character, to resort at once to an interscapulo-thoracic amputation, was debatable. In the case reported by Dr. Fowler, the patient had already had a portion of the upper limb removed, which mitigated the shock of the final and more serious operation. The speaker said he had done this operation for sarcoma of the shoulder twice with success, and in at least one of the cases the shock was very severe. Furthermore, the amputation leaves a very large wound, and one which it is difficult to preserve from infection.

DR. FOWLER, in reply to a question, said his patient showed no evidences of kidney trouble or glycosuria, and there was no history of syphilis. After the last operation the urine contained some albumen and a few hyaline casts, but this was only temporary. The speaker said it was not uncommon to find this abnormal condition of the urine after the occurrence of prolonged suppuration, improvement taking place with the cessation of the latter.

DR. V. P. GIBNEY said that, after an extensive and prolonged osteomyelitis in children, we may get marked changes in the liver and kidney, even amyloid kidney, which may be recovered from after the suppurative process has disappeared.

DR. FOWLER, in closing, said the shock is due to the loss of blood and interference with large nerve-trunks. The first named

is provided against by preliminary ligation of the subclavian artery. The shock after an interscapulo-thoracic amputation, therefore, should be not more severe than in amputation at the shoulder, because in both the brachial plexus must be divided.

As regards the danger of infection, the speaker said it would be less rather than more if the more extensive operation was resorted to at once, because, under the circumstances, the incisions can be made far and wide from the infected area. On the other hand, if we do consecutive amputations and wait until the clavicle and scapula have become invaded, it is much more difficult to avoid the burrowing sinuses, and the danger of infection is consequently greater. Dr. Fowler said that in his own case, could he have foreseen the repeated recurrences, he would have resorted to the interscapulo-thoracic operation at the very outset.

TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, December 4, 1899.

The President, RICHARD H. HARTE, in the Chair.

EXTENSION APPARATUS FOR FRACTURED PATELLÆ.

DR. W. BARTON HOPKINS exhibited patients showing results of fracture of the patella treated by a special extension apparatus which consisted of a series of adhesive straps applied to the thigh in an intersecting diagonal form, each strap terminating in a ring at the knee, one-half of the series being attached at the outer side and the other half at the inner side. The ordinary extension cords connect the rings with the pulley-cord over the foot of the bed. It acts like the familiarly known Indian finger puzzle, which, slipping readily on the finger, tightens as traction is made on it and is difficult to pull off. Traction upon the rings exerts two distinct forces upon the thigh, the force of extension downward and the force of constriction. The former draws down the integument of the thigh and, by means of a bridle placed across it, the upper fragment of the patella. The latter, by exerting a continuous unremitting constriction, paralyzes the muscles of the thigh in a remarkable manner, without causing the distal portion of the limb to swell at all from impediment to its circulation. In this respect it acts quite unlike a snug bandage similarly applied. The apparatus does not control the knee-joint, but its disabling effect on the flexors as well as on the extensors of the thigh noticeably prevents any tendency on the part of the patient to flex his leg; the muscular relaxation becomes especially apparent when passive movement of the leg within ten or fifteen degrees is made. Such movement has been made in all these cases almost from the first, and it is readily conducted without at all disturbing the fragments, by simply elevating the knee from the bed. The ultimate

restoration of complete motion at the knee-joint obtained in these cases is largely attributable to this early and continuous passive movement, and partly, too, to the entire freedom from tissue irritation and infiltration following the concentrated pressure of straps, compresses, or other retaining appliances immediately about the joint. The apparatus is usually kept on for seven weeks, and is apt to require one renewal during that time. It is an extremely comfortable one for the patient, which, on account of the long course of treatment required, is a matter of no small importance.

It has been usually applied on the fifth day, after the first inflammatory reaction has begun to subside. Eight pounds' weight is generally sufficient, but there is no disadvantage in adding more, if necessary. It is a matter of common observation that the lower fragment seldom requires any attention; and so it has been found in the cases treated by this apparatus, seldom so much as a steadying strap being used to keep the lower fragment in place.

Dr. Hopkins presented cases in which the injury had occurred from one to five years before, in which the separation of the fragments at the time of the accident varied from three-quarters of an inch to an inch. In all there was very close union of the fragments of the patella, and the restoration to normal function was found to be very perfect. The occupations of the several subjects required severe exertion, including stevedore and athlete. The latter performed some manœuvres requiring great muscular effort and extraordinary activity.

Dr. JOHN H. BRINTON presented a man who had received a compound fracture of the patella about twenty-three years ago. He was treated by adhesive strips, extension, and elevation, without any operative procedure; and after twelve weeks the wound and fracture healed with ligamentary union. He was then so unfortunate as to jump from a car and refracture the patella, or rather the fragments separated for an inch or more. He was careful afterwards, and ultimately made a very good recovery.

The separation after healing in this case was nearly a half inch: perhaps it gradually got a little less. There has been some bony union, but as far as the function of the wound is concerned, his motions have not been materially impaired. There is one noticeable occurrence here, and that is, that within the last three

or four years a slight ossific deposit has taken place between the old fragments of bone. The power of the limb has been perfect, and he has been enabled to carry on his usual avocations. In fact, the injury has in no way interfered with his life work.

Dr. Brinton also exhibited two specimens, casts which, he said, presented an almost historic interest. Some twenty years ago, when he was on duty at the Blockley Hospital, he had a patient in the surgical ward, who, before he left, showed him the leg from which these casts were taken, which show, in the extended position, a separation of the fragments of the patella of three and one-half to four inches.

The man recalled to Dr. Brinton's mind where he had seen him in Washington during the days of the Rebellion. He said: "I was a Rebel mail-carrier, and I carried the Southern mail between Point of Rocks and Washington, some twenty-five miles. I travelled sometimes on foot, sometimes mounted, and generally made one trip daily to or fro." He said that such and such a beer saloon was the Southern post-office in the city of Washington, and letters were there received or mailed for delivery. That man at that time was encumbered with this knee, and yet, as he said, he walked twenty-five or thirty miles daily. This bears out the observation of Dr. Hopkins as to the possible usefulness of a broken knee, and in this case the value of the man's limb did not appear to have been much interfered with.

The fracture of this patella had occurred ten or twelve years before the war, in his early life.

DR. RICHARD H. HARTE said that there are certain classes of cases that every surgeon is called upon to see where a percentage of the cases will do well, and others where an indifferent result will be obtained, no matter what method of treatment is pursued. The character of the fracture and the amount of destruction of the fibrous tissue around the patella influence to a very great extent the amount of deformity. If there is a simple fracture of the patella, without any laceration, to speak of, of the fibrous capsule of the patella, there will be little or no deformity, provided the accessory bands of the quadriceps extensor tendon are left intact. In these cases almost any treatment in which the patient is kept at rest with the leg extended will naturally have a good result. In other cases, where there is a great deal of separation of the fragments, with a corresponding laceration of the quadriceps ex-

tensor tendon, great deformity will result, and difficulty will be experienced in getting a satisfactory approximation of the fragments. Retention of the fragments is often very much complicated by having to deal with a very small portion of bone which has been torn up, especially at the upper attachment of the quadriceps extensor tendon. As to treatment, he had tried almost every known method, including extension, counter-extension, with adhesive plasters, with weights and the Agnew splint. He had used hooks and sutures. In some he had obtained most excellent results, and in some the results had been indifferent. He had used in late years, simply as a matter of convenience, Malgaigne's hooks, which he thought, on the whole, to be one of the most satisfactory means of dealing with these conditions. He had never had any bad results, and he thought the unfavorable accidents which had occurred from the use of the hooks had resulted before the proper introduction of modern surgical asepsis. To illustrate how simply some of these cases can be treated, he detailed the case of a fracture occurring in the person of a bar-tender, who refused to go to bed and remain there, but who, after his physician's visit, got up, and, taking the bung-stave of a barrel, which conformed pretty accurately to the contour of the leg slightly flexed, and, padding the bung-hole carefully, inserted the two fragments of the patella through the hole, and then bandaged it on the anterior portion of the leg. On the return of the physician the next day he was found in this position, attending to his work, and refused to have any further surgical interference. The case ultimately resulted most satisfactorily. Dr. Harte was a firm believer that in all cases of fracture of the patella, after the removal of no matter what dressing that had been used for the retention of the fragments, the leg should be kept in the extended position for many months, allowing no strain upon the new fibrous tissue which is thrown out between the fragments, as in a great percentage of these cases, no matter how satisfactory the result may be, the bond of union may nevertheless be of a fibrous character, and if tension is made upon this new tissue, it is in time bound to stretch, and the deformity will be progressive.

DR. GWILYM G. DAVIS said that the two cases here presented are both accompanied by statements of good functional use of the limbs. It depends upon what one considers "good functional results." A child may have a paralyzed leg and may walk far

and get around well, but still one would hardly characterize it as being a *normal leg*, and he thought that these cases resemble those of paralysis. He presumed both of these had practically flail-legs; they would throw the limb out and it would come down with a thump. They may have been able to continue that all day long, but he doubted whether people in the ordinary walks of life would be satisfied with such a result, even though they could manage to get along. He would not call that "good functional results;" it rather goes to show to what extent persons can accommodate themselves to disabilities.

In regard to the cases that Dr. Hopkins had shown, he thought they were among the best illustrations of the conservative studies of the subject that he had had his attention called to. They certainly were a strong argument for conservative treatment. He had operated in these cases many times, and he had never had any trouble, except on one occasion, when, after wiring the patella, a small sinus persisted and necessitated the removal of the wire. This was not accompanied by any disturbance of the joint, and there was never any occasion for alarm. The main object of operating on recent fractures—not compound—is that of saving time to the patient. He had a patient, after he had the patella sewn together, leave the hospital in good condition, and in a comparatively short time rebreak it; and he had come to the conclusion that, as far as his own cases were concerned, he would like them to wear some retaining apparatus for about a year after the reception of the injury, whether their patellas had been wired or whether they had been treated conservatively. In other words, after a patella has healed, it stands in great danger of being refractured; and if it is best to take this precaution for so long after the reception of the injury, one might as well treat it conservatively from the start, rather than subject it to operation.

DR. DE FOREST WILLARD presented a patella removed some eight or ten years after fracture in a woman seventy years old. It has been sawn longitudinally, and on looking at the cancellated structure no evidence of lesion is visible; but upon the posterior and anterior surfaces there is a distinct transverse line marking the seat of fracture. There has been perfect bony union. He attributed the perfect result in this case to the fact that he saw the old lady within five minutes after she fell and she had not attempted to get up. She lay on the floor, had not used her leg,

had not separated the fragments, as there had been no muscular action, and he immediately had her under treatment. The thigh was first placed in a flexed position to relax the quadriceps, and later he applied the Agnew splint, which fixed the fragments and drew them together. There was one-quarter of an inch separation when he first examined her, and the fragments were perfectly movable.

CARCINOMA OF THE RECTUM.

DR. JOHN B. DEEVER presented two patients to show the type of result he had had to follow the modified Kraske operation. The first patient has complete sphincteric action. In the second case the control over the bowel is only partial. In neither of these cases is there much to be seen other than the presence of the scar. In the patient first presented, in addition to the scar, there is still an ulcerated surface at the extreme lower end of the wound, the result of an unhealed faecal fistula. In the case of this patient he excised three inches of the bowel and made an end-to-end union. Fortunately, the growth was far enough within the verge of the anus to allow the external sphincter muscle to be undisturbed. The faecal fistula is the result of breaking down of the line of union at the site of the fistula. In his experience, these fistulae ultimately close. In the case of the present patient, it was necessary to dilate the sphincter muscle some three weeks after the operation to favor the rectum emptying by the natural way.

In the case of the second patient, he was not able to save the external sphincter on account of the low situation of the growth. There is, however, considerable control over the bowel, which he attributed largely to the levator ani muscle. The latter patient is only twenty-five years of age. It is comparatively rare to meet with the disease at this age. The case was believed to be one of simple stricture: digital examination revealed, however, the presence of the induration so typical of these cases. Blood count showed both anemia and leucoeytosis. In this connection he referred to a patient upon whom he operated in the early summer of 1898, doing the same operation as was done in the first patient presented. This man remains perfectly well, with perfect control of bowel. The operation as done by Dr. Deaver consists of removing the lower two or three pieces of sacrum with the coccyx. This is done by separation with the chisel or osteotome and a pair

of scissors grooved on the flat. With the bone removed, efforts are directed to the arrest of the hæmorrhage. The latter, in the speaker's opinion, is one of the most important steps in the operation. The next step in the operation is freeing the bowel. It is important to preserve as much of the levator ani as is consistent with safety, also to divide the bowel at a considerable distance to either side of the growth. Where the section of bowel entails removal of more than two inches, the peritoneal cavity must be opened to allow the sigmoid to be drawn down. So soon as the latter is done to the required distance, the parietal peritoneum at the site of the incision is stitched to the serous covering of the sigmoid and a temporary packing of the gauze placed against the line of suture. This has thus far, in the speaker's experience, served to guard against peritoneal infection.

The remaining step in the operation, the bowel having been removed, consisted in apposition of the two ends with suture. The wound is now carefully and gently packed with gauze and the patient returned to bed. Stitches in the external wound are used simply to close the upper and lower angles of wound; practically all of the wound is left to heal by granulation, being packed tightly with iodoform gauze.

It is not his practice to do preliminary colostomy except in cases where the radical operation is out of consideration.

LONGITUDINAL SECTION OF FEMUR FROM PELVIS FOR ANKYLOSIS FOLLOWING HIP DISEASE.

DR. DE FOREST WILLARD presented a man, twenty-six years of age, who fell, impaling his hip on a fence, at the age of four years. The injury was followed by inflammatory symptoms, then with tubercular infection of hip, and for ten or twelve years abscess followed abscess, until the entire head and neck of the bone had apparently been destroyed. No operative interference, apparently, was instituted, and the upper end of the femur finally became ankylosed to the outer face of the pelvis for several inches, and at a right angle; it was also in the adducted position, the median line of the body falling externally to the outer condyle. To add to his difficulty in locomotion, there had also been a vertebral ostitis, which prevented the spinal column from assuming the usual condition of compensatory lordosis; and, as the spine

was rigid throughout both lumbar and also dorsal regions, he was obliged in walking to throw his trunk to almost the horizontal position at each step. In standing, the heel was eight and one-half inches from the ground; progression was therefore very laborious and painful.

Since a simple osteotomy through the shaft of the femur at



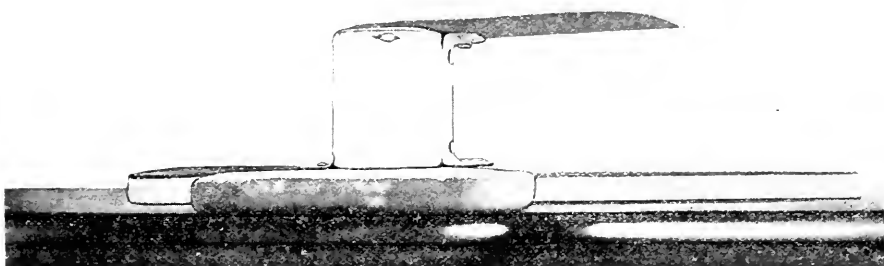
Hip disease. Ankylosis of left hip at right angle. Spine also rigid.

any point would have placed the lower fragment at such an angle with the upper that serviceable union was doubtful, he therefore attempted to cut away the femur longitudinally from its attachment to the pelvis, and bring it into an approximately straight position. A skiagraph assisted in determining the line of section. As the hip was surrounded with cicatricial tissue from multiple abscesses (which had, however, been entirely closed for

nearly five years), a long incision was made through the most healthy tissue, and he was able at last, with the osteotome and chisel, to free the bone; firm, powerful pressure for thirty minutes finally stretched the surrounding fasciæ and tissues until the bone was brought to within fifteen degrees of the straight line, where it was fixed with plaster-of-Paris dressing extending from thorax to toe. With the largely altered tissues and the extent of the section, Dr. Willard expected suppuration, and therefore inserted drainage; but this was very slight, and the wounds were all healed in six weeks; he was walking upon crutches in seven weeks, and now, with only three inches of cork under the foot, is able to walk without a cane, in an erect position, with no adduction, and with a thigh only fifteen degrees out of the straight line.

PELVIC SUPPORT FOR APPLYING GYPSUM DRESSINGS AND SPICA BANDAGES AT HIPS.

DR. DE FOREST WILLARD remarked upon the difficulty presented in applying plaster bandages to trunk and thigh, especially in a fat man or woman, without disturbing motion at the hips during its application and subsequent setting. During the process of setting of a plaster bandage, it is absolutely essential that quiet



Pelvis-supporting stool for applying dressings at the hips.

should be secured, otherwise the long leverage of the leg will certainly impair or break the case at the groin, even if metal strips are used. As a support in such cases, he showed a stool made of two boards fastened in the shape of a cross, one twelve inches, the other eight inches in length. Securely erected upon a post is a thin metal plate six inches long, three inches wide, slightly curved, to add strength and also to adapt itself to the shape of the sacrum; this plate is supported four inches from the

board by a hollow square metal pedestal, so as to give room for the hand and bandage to pass readily between the patient's pelvis and the table. The sacral supporting plate is strongly riveted to this post and projects only in one direction from this post, *i.e.*, upward towards the lumbar region, like an inverted and reversed letter L, "┐." When padded with cotton, or gauze, or a towel, the plate is still so thin that it does not interfere with the application of the bandage; and, after the setting of the gypsum, the stool is easily removed by sliding it downward towards the buttocks, since all the bandages have passed above the supporting post. To secure a straight subsequent lying position, a pillow or pad should be placed beneath the shoulders during the dressing, but when ordinary spica bandages or dressings are being applied this is not necessary.

In the application of plaster dressings after the radical operation for hernia, as well as for the ordinary spica in operations about the hips or pelvis, this stool will be found most serviceable, both for children and adults, giving, as it does, a firm and continuous support as long as necessary.

CHOLECYSTOTOMY.

DR. DE FOREST WILLARD presented a woman, fifty-six years of age, who had suffered for eleven months with recurrent attacks of severe pain on the right side of abdomen, attacks being accompanied with rigor, vomiting, and pain throughout the right half of the abdomen, but not radiating towards the right shoulder. These attacks were followed by jaundice, light-colored stools, and tenderness below the costal margin. For several weeks these pains recurred every other day; at times, however, there would be an interval of several weeks; recently, the returns have been more severe; patient had lost flesh rapidly, giving rise to a suspicion of malignant disease.

Patient was admitted to the medical ward of the Presbyterian Hospital, under the care of Dr. Stryker, September 8, 1899. Skin and mucous membranes slightly tinged. Physical examination of chest showed healthy organs. There was tenderness in right abdomen, most marked in the lower segment, and about the umbilicus, rather than over the gall-bladder. Pressure over the appendix quite painful. Attacks of biliary colic continued with increasing severity, commencing in the region of the gall-bladder,

radiating to back, but not to shoulder; the jaundice increasing after each crisis, but yet was very slight; suffering intense. Urine contained trace of bile, and after the attacks showed hyaline casts, occasionally epithelial casts, and at intervals a trace of albumen.

Blood examination showed, September 19, lymphocytes, 22 per cent.; large mononuclear, 4 per cent.; transitional, 17 per cent.; polymorphonuclear, 56 per cent.; eosinophiles, 56 per cent.; no micro- or macrocytosis.

Blood examination, September 21: Lymphocytes, 35 per cent.; large mononuclear, 5 per cent.; transitional, 9 per cent.; polymorphonuclear, 50 per cent.; eosinophiles, 1 per cent.; no macro- or microcytosis.

Transferred to surgical ward (Dr. Willard). Operation, October 2. Ordinary incision. Gall-bladder distended, one-third larger than normal. Large calculus palpable in the neck of the sac, and the dilated commencement of duct. A calculus the size of the last phalanx of one's little finger was removed through small incision at the neck. The duct was examined and no other calculi discovered. The wall of the gall-bladder and the lining membrane both being in good condition, the wound was closed by a row of silk sutures reinforced with a row of Lembert sutures, inverting the wound; the peritoneal abdominal muscles were separately closed by catgut stitches, without drainage; skin closed with silkworm. Patient had no attacks of colic after the operation, and, save for a slight wall abscess from an explainable cause of infection, had no further trouble. At no time was there any discharge of bile from the wound. The stools soon became natural in color and consistency, and the patient improved in health and strength.

Immediate closure of the gall-bladder is only applicable to cases where the walls of the organ are in good condition, and when the contents are not purulent. When indicated, however, this method is of decided advantage in preventing the troublesome and sometimes very tedious biliary fistula that not infrequently (one case in five) follows cholecystotomy with drainage.

Dr. Willard said that he did not intend in reporting the case to have it inferred that the ordinary gall-bladder should be sutured, but in certain cases, as in this, where the walls were perfectly healthy, where there was no suppuration whatever, where the

contents of the gall-bladder were simply bile and mucus, it was proper to insert sutures so as to close the bladder absolutely without drainage, and thus gain a good, strong, solid wound; for, in his experience, the biliary fistule that remain after an ordinary cholecystotomy are troublesome; some remain for many months, and some for years. He had a patient now with a fistula for two years, constantly discharging bile, and it is of great annoyance to the patient. If there has been suppuration, however, he did not think it wise to trust to such closure.

DR. HENRY R. WHARTON said that he thought it to be rather unwise, in the majority of cases, to do the ideal operation as regards the immediate closure of the gall-bladder, since the obstruction in many cases is due to an inflammatory condition of the mucous membrane of the common duct as well as to the presence of a stone in the gall-bladder or duct; and that if closure without drainage, after removing the stone, is resorted to, that obstruction still persists; but in the cases in which drainage is used in the majority of cases the bile escapes from the drainage-tube or the gauze-drain for a time, and as soon as inflammation subsides—as the result of drainage—the re-establishment of flow through the duct occurs. If the surgeon is certain that the ducts are patulous, of course he can consider the immediate closure of the gall-bladder. On general principles, it should not be recommended as a usual operation, but only when one is absolutely certain that the gall-ducts are in good condition to carry off the discharge.

DR. JOHN B. DEEVER said that delay in closure of the fistula does not occur when the gall-bladder is attached to the aponeurosis of the external oblique muscle, leaving the skin and superficial fascia free.

It was his custom to make the incision through the rectus muscle, for one gets better union and a greater safeguard against hernia by so doing. The superficial fascia forms an ideal bed for granulations which close the fistula.

DR. DE FOREST WILLARD said that he did not suture to the skin because, in his opinion, one secures better union by suturing to the deeper tissues, either to the aponeurosis, the peritoneum and transversalis fascia, or the muscles. All that is required is to close off from the peritoneal cavity.

RUPTURE OF THE LIVER.

DR. WILLIAM G. PORTER presented a ruptured liver, saying that the person from whom it was removed was a patient in the Presbyterian Hospital. He was twenty-five years of age, was a railroad brakeman, and was brought into the hospital in a condition of shock, with the history that he had been thrown down and trampled on by quite a large number of men who were endeavoring to escape an approaching collision between two cars. When he was admitted, there was no evidence of any fracture or dislocation. The man was simply profoundly shocked, and had an abrasion over the thorax. He would not locate any trouble at that time. He slowly reacted from the shock, and twenty-four hours afterwards began to vomit. At no time was there any passage of blood, either in the urine or from the bowel or in the vomited matter. In the first place, the abdomen was not distended at all. It was tender, however, on pressure. Vomiting came on about twenty-four hours after his admission. The tenderness increased over his abdomen, and then there was quite considerable tympanitic distention. The temperature then rose, with a very decided difference between the temperature tracings when they were taken under the tongue and when they were taken in the rectum. That difference is almost always uniformly two or three degrees, and sometimes varied as much as four degrees. The vomiting was relieved after about forty-eight hours, when his bowels were emptied by an enema and the internal administration of calomel; but he still lay with this exalted temperature, with pain, with tympanitic distention of his belly, so that all supposed that he had a general peritonitis as the result of the trauma. He gradually declined, and on the sixth or seventh day after the injury he died. At the autopsy, when the abdomen was opened, no evidences whatever of peritoneal inflammation were found, but the whole cavity of his pelvis was filled with blood, and, on looking for its source, it was found in a ruptured liver, which is shown in the specimen.

DR. J. CHALMERS DA COSTA said that some two years ago, in the Philadelphia Hospital, he saw a case of laceration of the liver, resulting from fracture of the ribs. The man had been making an excavation. There had been a fall of earth, and he was brought into the hospital in a condition of shock. The resident physician

examined him and detected two fractured ribs; administered the ordinary restoratives for a condition of shock, and also had straps of adhesive plaster applied to his side for fracture of the ribs. The next afternoon, some twenty-four hours after the accident, it was observed that he began passing into a condition of collapse, with signs of intra-abdominal hæmorrhage, shifting dulness in the flanks, collapse, feeble and rapid pulse, accompanied by abdominal pain. On opening the abdomen, a laceration of the anterior surface of the liver was found, which was bleeding furiously. Stitches were applied, but they would not hold, and the wound was packed with gauze, which controlled the hæmorrhage. The incision was made anteriorly, and, as far as the operator could reach and see, no other laceration was discovered. This hæmorrhage was completely arrested. He lived some forty-eight hours, his symptoms having abated for a time. He, however, became worse with great rapidity, and died forty-eight hours after the operation. The specimens are now in the Philadelphia Hospital.

An examination was made by Dr. Stengel. The bleeding from the anterior wound had not recurred. It was discovered on the posterior surface of the liver that the end of a rib, very near the spine, had inflicted another injury as grave as that inflicted by a rib on the anterior surface. The only way to have found and reached that posterior injury would have been by an extensive rib-resection. The problem is: There has been a severe injury, either a crushing force or an injury that breaks ribs, lacerating the liver on the anterior surface. When an injury is found and the hæmorrhage arrested, should an extensive investigation be made to determine if there is another hepatic injury?

THE RADICAL CURE OF HERNIA.

DR. GWILYM G. DAVIS said that in 1895, Dr. George Tully Vaughan, United States Marine Hospital Surgeon, who was then stationed in Philadelphia, brought to his notice his method of operating for the radical cure of hernia. It was published in the *Journal of the American Medical Association* of July 25, 1896. His account is as follows: "Divide the conjoined tendon through its muscular part four or five centimetres above its insertion, including the internal pillar of the ring down to the peritoneum, avoiding the deep epigastric artery. Separate by blunt dissection

the conjoined tendon from the rectus and pyramidalis muscles down to the pubic bone, and place the cord in this position between the conjoined tendon and rectus. The cord still passes through an oblique canal at its anterior portion as the conjoined tendon overlaps the rectus and pyramidalis for 2.5 centimetres or more being inserted in front of these muscles. Unite the divided ends of the conjoined tendon and internal pillar with mattress sutures, and accurately approximate them with continuous and interrupted sutures."

This was the first time Dr. Davis's attention had been directed to transplantation of the cord inward instead of keeping it out in the neighborhood of the internal ring. He insisted on the advantages of having the hernial opening entirely closed from the spine of the pubes out, thus obviating the liability of weakening it by allowing the cord to pass through the line of union. As the recurrences which had come under Dr. Davis's notice had taken place in the line of the wound, he felt that placing the cord at the inner angle was a distinct advantage, and he had practised it with more or less regularity ever since. Being unwilling to cut the muscular portion of the internal oblique and transversalis as Dr. Vaughan had done, he at first divided the conjoined tendon near its insertion into the spine of the pubes, then placed the cord to its inner side and sewed the divided conjoined tendon again down to the pubes. This he felt, however, weakened the abdominal wall at this point, so he soon contented himself with dividing the tissues down to the pubic bone just to the outer side of the conjoined tendon, and allowing the cord to hang over the pubes at this point. Sometimes he would nick the edge of the conjoined tendon to allow a little more room for the cord. The internal oblique and transversalis muscles with the fascia beneath were then sewed to Poupart's ligament, and the external oblique closed with a continuous suture. About this time, Dr. J. Coplin Stinson published his method in the *New York Medical Record* of March, 1896; and recently, in the *ANNALS OF SURGERY* of October, 1899, he again advocates it. He uses three layers of sutures besides those of the skin. He says, "Commencing at the upper angle, bring the inner and outer borders of the transversalis fascia accurately together with continuous sutures, leaving only sufficient room at the lower angle close to the pubic bone for the cord." He then sewed the internal oblique and transversalis muscles to

Poupart's ligament, and united the cut edges of the external oblique. Dr. Ferguson, *Journal of the American Medical Association*, July, 1899, advocates practically Stinson's method as described above. Believing that the hernia is due to a deficient origin of the transversalis and internal oblique muscles at Poupart's ligament, he says he "entered the sewing (of the internal oblique and transversalis muscles) fully two-thirds down Poupart's ligament, which is the normal origin of this muscle." In the same article he states returns usually occur at the upper and outer portions of the wound. William J. Mayo, writing in the *ANNALS OF SURGERY* of January, 1899, says he has seen William T. Bull unite the deeper muscles over the cord to Poupart's ligament and then suture the external oblique. William B. Coley, *ANNALS OF SURGERY*, 1897, p. 280, states that for four years he and Dr. Bull have in some cases placed the cord inward and sutured both the deep and superficial muscles over it. He and Dr. Bull, writing together in the *ANNALS OF SURGERY*, Vol. xxviii, 1898, p. 599, say that suture of the canal without transplantation of the cord has much to commend it, the remaining steps being the same as for Bassini's operation.

Finally, Dr. Davis was convinced that he had read of others employing the same procedure. These facts, he submitted, were sufficient to show that the supremacy of the operation of Bassini is threatened, and a new school is arising which opposes the laying of the cord either between the superficial and deep muscles, as does Bassini, or over both, as does Halsted, and advises instead the union of both layers over the cord. Comparatively few, however, go to the length of G. R. Fowler, *ANNALS OF SURGERY*, Vol. xxvi, 1897, p. 603, who advises placing the cord within the peritoneal cavity.

A second point to which attention is called is the treatment of the transversalis fascia. Dr. J. C. Stinson and Ferguson both sew it as a separate layer. He knew of no others who do; Bassini and Halsted do not. Personally, he had sometimes found the transversalis fascia so thick as to enable one to suture it shut separately, but usually he had brought both the deep muscles together with the underlying fascia to Poupart's ligament in a single layer of sutures, and then closing the incision in the external oblique.

In dealing with the sac after ligating it as high up as possible and cutting it away, he had brought the two ends of the chromi-

cized ligature up through the muscles above the internal ring and tied them on the surface of the external oblique. The peritoneum having been somewhat separated, this procedure allows the site of ligation to be drawn up somewhat higher than it otherwise would be, and fixed in place.

In concluding, the following propositions are submitted for discussion:

(1) Is it best to lay the cord close to the outer edge of the conjoined tendon and unite all the structures above the peritoneum over it?

(2) Is it always possible or advisable to unite the cut edges of the transversalis fascia as a separate layer?

(3) Is there any advantage in ligating the ends of the sac ligature on the muscles above the internal ring instead of cutting them short?

DR. JOHN B. DEEVER advocated the Bassini operation, with one modification, the Macewen method of disposing of the sac. Macewen's operation has two very strong points in its favor. One is the non-division of the aponeurosis of the external oblique. That is one of the weakest points of any open operation. The divided aponeurosis of the external oblique cannot be restored as nature made it. Then, the second point is the disposition of the sac. The cases of recurrence he had seen, in the majority of instances, had occurred at the upper point of the wound, at the site of the so-called internal ring,—there not being such a thing anatomically. Now, if that is the case, it would argue in favor of the open operation as far as the restitution of the lower part of the canal is concerned. It is in the majority of cases that the recurrence takes place above, which shows that the integrity of the lower part of the canal is restored by the Bassini operation.

He understood that Dr. Davis passes the ends of the ligature used to tie in the neck of the sac through the overlying abdominal walls, tying them down upon the aponeurosis at the external oblique, and in this wise fixing the neck of the sac well within the internal abdominal ring. This, to his mind, does not, however, dispose of the concavity upon the inner aspect of the abdominal wall which exists in the shape of the external inguinal fossa. That this fossa, coupled with elongation of the mesentery, accounts for the majority of cases of inguinal hernia of the small bowel, must be admitted. Dr. Davis's method, therefore, does

not dispose of this concavity. The nearest approach to it is the Fowler and Halsted method, where the peritoneum is cut off flush with the parietal peritoneum and sutured. It is Dr. Deaver's practice to invaginate the hernial sac after the manner of Macewen, carrying it through the mouth of the hernial sac and anchoring it at this point. He knew that objections had been raised against this method of disposing of the sac, as in Coley's paper referred to by Dr. Davis. Coley takes the ground that nutrition of the sac when disposed of in this manner is in danger, and that sepsis and suppuration are more likely. This may be true, but it had never occurred in the practice of the speaker. He agreed with Dr. Davis that it is relatively better not to cut the internal oblique muscle. This is one of the strongest objections to Halsted's operation.

DR. RICHARD H. HARTE said that his own method was a modification of Halsted's, and he had no fault to find with that operation. He agreed with Dr. Deaver, and also with Dr. Davis, that when recurrences occur they start in the upper part of the incision, or the so-called internal abdominal ring, which is supported almost entirely by muscular tissue. He thought there was very little difficulty in closing what corresponds to the external ring, but pouting in the upper part of the wound is not at all uncommon in persons especially of relaxed abdominal walls, say a couple of inches from the spine of the pubis. Every surgeon who has attempted to operate the second time on cases of recurrence knows how unfavorable these cases are. The question of dealing with the sac is a most important factor in the success of all hernia operations. The method pursued consists in cutting off or tying the end of the sac, tying a purse-string around it and dropping it back or pouching it after the method of Macewen. The other methods are faulty, as they do not obliterate the hernial pouch in the peritoneum, leaving the conditions favorable for recurrence. The Macewen proposition to make a large plug and leave it there, is undoubtedly good, as it acts as a buffer in cases of attempted recurrence; but it is not always a safe procedure, as he recalled two fatal cases, one which he saw operated on and another in the service of a colleague. The unfavorable results were undoubtedly due to the sloughing of the sac. He had tried faithfully all of the different methods for the radical cure of hernia, and felt convinced that some modification of the Italian

operation is the best: but, nevertheless, the weak point of all operations is the failure to fortify the so-called internal abdominal ring.

DR. W. JOSEPH HEARN said that the recurrences that he had seen took place in the upper part of the incision. For that reason he never did a Halsted operation. He did not care to cut these muscles, for more or less atrophy takes place; they are left weak. He very rarely saw a hernia occur close to the pubic bone. He had come to the conclusion that it is better to leave the cord on the pubic bone, where nature intended. He was sure that there are a great many cases of strangulated hernia where the patient's condition did not justify a radical operation for its cure. He had been in the habit of sewing up the ring with silver wire and leaving it there. He had never had infection, and he had had no return of the hernia. He simply made a barrier of silver wire.

DR. ROBERT G. LE CONTE said that he did not see that a hernia could return in any other position except the upper part of the wound, if that is the place the cord leaves the peritoneal cavity. The internal ring, where the cord leaves the peritoneum, is the point of weakness, and whether one makes this high up in the incision, as in Halsted's operation, or low down, as in Stinson's, it will be the point at which recurrence takes place. As to the radical cure of hernia in the operations spoken of,—Halsted, Bassini, and Stinson,—the principles are different. Dr. Halsted brings the cord directly out of the abdominal cavity, at a right angle to the plane of the abdominal wall, and diminishes its size by the ligation of some of its veins. In this way the intestinal pressure from gravity is removed, but the general intra-abdominal pressure is in no way combated, except by the slight diminution in the size of the cord. Dr. Stinson's operation is the opposite of Halsted's in that the cord is brought out at the lowest portion of the incision and deflected towards the median line. It does not oppose the intra-abdominal pressure or the gravity pressure, except by the angulation of the cord as it goes over the pubic bone. Here recurrence should take place always at the lower portion of the wound. Bassini's principle is to return the inguinal canal to its original condition, and so oppose the recurrence of hernia by nature's method. When a hernia takes place and has persisted for some time, the internal and external rings are approximated. The internal ring descends and approaches the external ring, and in

an old hernia the two rings will practically be together. In the normal abdomen, we have a distance of an inch and a half or two inches separating the position where the cord leaves the peritoneum and where it makes its exit through the abdominal wall. The strength of the inguinal canal in a normal abdomen is due to its oblique passage through the abdominal wall and to the muscular action of the external and internal oblique. These muscles acting, the fasciæ overlying and underlying the cord are drawn tense, and the longer the canal the greater will be the resistance to the passage of bowel. He did not see why a long mesentery or any peculiarity of the fossa should be more than a slight predisposing cause of hernia. He knew of several men who had gone through an active existence, to the age of sixty and sixty-five, who had suddenly developed hernia during a paroxysm of coughing. He did not think this was due to a sudden lengthening of the mesentery or to any changes of the fossæ inside of the abdomen, but rather to a relaxation and loss of tone in the muscular walls of the abdomen from old age. In other words, the length of the mesentery and the fossa had remained in the same condition for many years, but the muscles and fascia of the abdomen had changed from age. He therefore thought that Bassini's operation is the best in theory, and in his practice it had proved most successful in suitable cases. Any modification of it, however, is faulty, as it defeats the principle on which it is founded.

DR. GWILYM G. DAVIS said that, as far as the use of the sac as a pad goes, that has been thrashed over pretty thoroughly of recent years, and he thought the verdict of the profession was practically against it in inguinal hernia. In femoral hernia it is still open to discussion. The question that he had hoped to see discussed was that of the transversalis fascia. Is there or is there not a transversalis fascia forming a distinct layer? Dr. Deaver apparently settles the question when he says there is no internal ring, because the internal ring is commonly supposed to go through the transversalis fascia. As far as Dr. Davis's personal experience went, he believed that sometimes there is a fascia that can be sewn together separately, distinct from the muscles above and peritoneum beneath. One will sometimes find just beneath Poupart's ligament another layer of fibres, which he believes is the thickened edge of the transversalis fascia. When he found thickening of this sort, then he united it as a separate layer. But

it is evidently not there always; therefore he hardly saw the justness of Drs. Stinson and Ferguson describing uniting the transversalis fascia as a distinct layer as a routine procedure. As regards the incision of the muscles. One reason why he was induced to transplant the cord internally was that he did not believe in dividing the external oblique muscle to anything like the extent usually done in operating for these herniæ. Hernia recurs towards the outer portion. The only object of making this incision so far out is to gain access to the internal ring, and he thought this could be done without going so far up as many operators do. The only difference between the incision for this operation and that of Bassini is that in this the incision goes a trifle closer to the median line, so as to enable one to expose the spine of the pubes and carry the knife down to the bone. The cord is laid there, and one is enabled to bring the conjoined tendon and its muscles closer down to Poupart's ligament.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. Observations and Experiments on the Principles of Asepsis. By DR. GEORG GOTTSTEIN (Breslau). This painstaking memoir, with its maze of statistics and its superfluity of logic, reduces itself to these statements.

The bacteriological control of the sterilized hand prior to operation tends to establish the relation of the healing of wounds to the disinfection of hands, and is superior to theoretical experiments.

In spite of the individual features of any modus in more than 57 per cent. of cases the hands were infected.

The individual susceptibilities have to be considered in the cleansing of hands, since some hands are easier cleansed than others, *e.g.*, operator, assistant, and nurse, in this order.

The occupation of the various hands in the interim of the operations influences the ease and degree of disinfection: it is easier, furthermore, to remove accidental germs from the hands than the normal epiphytes.

The apparent absolute sterilization with varying percentages of alcohol is delusory, since subsequent ablutions with sterilized water raise the percentage from 14 per cent. to 50 per cent.

At this stage, the author, finding himself in the position that in but 50 per cent. of the cases the hands can be sterilized according to Furbringer's method or modifications thereof, passes on to the experiments with cotton and rubber gloves.

Of sterilized cotton gloves he says, if the finger be artificially infected (control experiment) and subsequently disinfected, no germs pass through the meshes; but if the gloves be moist, germs

will pass through; yet their number is far less than if the bare hands be used. Thus, at the end of operations the bare hand showed infection in 86 per cent., the gloved hand in 73 per cent.

As cotton gloves become the depot for germs, they have to be changed often during operations.

When it comes to the use of rubber gloves, the author offers no plausible reasons for the presence of germs on their surface in as large a number as are under the cotton gloves.

In conclusion, the author looks to an ideal impermeable rubber glove having the same agreeable features as the Tricot glove. —*Beiträge zur klinischen Chirurgie*, Band xxv, Heft 2.

MARTIN W. WARE (New York).

II. Some of the Conditions on which an Objective Cure of Epilepsy depends. By PROFESSOR KOCHER (Berne). The surgical treatment of epilepsy is to-day in disrepute. Formerly, statistics of 60 to 70 per cent. cures were alleged, but a recent search of cases that have remained definitely cured shows only 2 to 4 per cent. of such to exist. Graf's collection of 1898 contained only eight positive cures.

The greatest improvement in recent years would appear to be the method of von Bergmann of excision of the cortical surface from which the abnormality seems to arise. Since 1880, Kocher's operations have been along the line of a personal theory, which has yielded him eight positive cures.

In the first place, observations have confirmed the line of treatment that is directed principally to the removal of the exciting cause,—removal of pressure, relief of adhesions, evacuation of abscesses,—68 per cent. cures.

The results in cases involving incision of the dura and removal of bony fragments, or of cicatrices impinging on the brain, are still better, 88.8 per cent. and 85.7 cures. The removal of cysts is less successful, 4.78 cures.

If we accept the influence of fragments of bone, cysts, and cicatrices as causes of epilepsy, in that their alleviation results in

a cure, we also find by comparison of two further classes of operations, that there exists another and equally plausible origin of epileptic seizures, which is not generally recognized, that is, local or general increase of intracranial pressure.

If we compare results of trephining, in which none of the above-mentioned conditions was found, with or without incision or excision of the dura, we get the following results:

Dura not opened, only 14.2 per cent. cures, while with opening of the dura, 54.7 per cent. cures. Therefore opening of the dura has a curative effect, *per se*, which needs to be analyzed. And it is most probable that it is to this very opening of the dura that cortical excision owes its good results. Support of this belief may be found in the fact that, while removal of an obvious source of irritation is followed by relief immediately or very soon following cortical excision, the convulsions remain relatively very severe, or are sometimes increased.

Trephining with opening of the dura produces a permanent lowering of pressure throughout the whole of the cranium; this result we bring about and intensify by the removal of large portions of the cranial contents, *e.g.*, by drainage. Opening of the dura is essentially the establishing of a valve, whose function it is quickly to equalize variations of pressure.

Careful investigation of the author's own material has demonstrated that the cured cases were those in which a valve was formed, which has become permanent, the covering membrane remaining free and sinking or bulging with the lowering or increase of intracranial pressure; while in the unsuccessful or recurrent cases the communicating aperture is closed, for the greater part or entirely, either by bony deposit or by a cicatricial mass so dense in nature as to render it as unyielding as a true bone formation. The importance of this fact is evident so soon as a comparison is instituted between fracture of the skull with or without loss of substance of bone and dura.

While simple fractures of the skull give rise relatively often

to epilepsy, in eighteen operations for extensive fractures, in only one did epilepsy result; these cases have been watched for an average of seven years.

Scars and adhesions, *per se*, do not necessarily provoke epileptic seizures, except in connection with other factors which are ordinarily termed predisposition. Epilepsy is observed to follow cicatrices resulting from marked inflammatory processes, such as occur in extensive necrosis of tissue or laceration of the brain. Aseptic scars found under a minimum of reaction are not ordinarily followed by epileptic manifestations.

The formation of cysts plays an important part in the production of traumatic epilepsy, as cysts are a necessary end result of cerebral destruction when an external outlet is wanting. Such cysts were present in a large proportion of the operations, and they are an important factor in the consideration of intracranial pressure, local or general.

In all operations, therefore, for the relief of traumatic epilepsy, the operator, in addition to dealing with such direct causative elements, as spicules of bone, cicatrices, and cysts, should bear in mind the influences exerted by variations of intracranial pressure.

Local lowering of pressure may be obtained in addition to a removal of a circumscribed bony area, by incision, and, still better, by excision of the dura. General lowering is accomplished in two ways. Cysts and collections of fluid in the ventricles may be drained, but in order to be successful the treatment must be carried on for months. The simplest method is by the use of a silver drainage-tube. Drainage may also be effected by making large holes in the skull, such as are obtained by osteoplastic resection, by diminishing the size of the bony portion; a gutter is left behind when the flap is replaced.

Finally, it may be laid down as a principle that the now well recognized increased intracranial pressure furnishes an explanation of that unknown quantity which has been called the *status*

epilepticus,—that is, a disposition towards epilepsy which may be due to anatomical changes from congenital conditions, or previous inflammatory changes, or tumors, or, finally, to the traumatism *per se*. This condition is interesting not alone from the point of surgical treatment, but as an incentive to the medical men to make efforts to produce the desirable lowering of pressure by internal therapy. It is possible that in the future prophylaxis of epilepsy it will not infrequently be held that opening of the skull does less damage than does the closing of it.—*Verhandlungen der deutschen Gesellschaft für Chirurgie, XXVIII Kongress.*

CHARLES L. GIBSON (New York).

NECK.

I. Experiences in the Surgical Treatment of Benign Goitres at Mikulicz's Clinic. By DR. E. REINBACH (Breslau). The organotherapy (thymus and thyroid extracts) of goitres having proven failures, the treatment of goitres now remains purely surgical, and the use of organic extracts reserved as a palliative measure to favorably influence subsequent operative procedures. On this account the author offers to fill certain gaps apparent in the otherwise extensive reports from other clinics. Thus a typical operative procedure is practised by Mikulicz for all cases, viz., resection of one or both halves of the thyroid. The steps of this operation as now perfected consist in a Y incision (Kocher), vertical division of the fascia, ligation of the superior thyroid vessels, division of the isthmus, ligation of the inferior thyroid, if desired, and then wedge-shaped resection of the gland; suture of the capsule, and then suture and drainage of the wound. The advantages over extirpation are, the recurrence is avoided, the operation is within strict physiological limits, as all the diseased is removed and enough of the healthy viscus is left to functionate; it therefore replaces enucleation entirely, and is superior to extirpation (Kocher), since the latter aims at total removal of half the goitre, the other half being left in situ whether totally or

partially diseased. Resection is generally bilateral; save where a great discrepancy in the size of the two halves of the goitre exists, it is unilateral.

The material at this clinic differs from that of others, inasmuch as the cases were sporadic, not as huge as the endemic variety, and a relatively large number of substernal (six) and accessory retrovisceral (three) were encountered. These latter are of interest, since they have to be differentiated from glands; this is possible by puncture. Percussion of the sternum to locate the gland behind it is not reliable. One hundred and sixty-two cases were operated with a mortality of four; all of the deaths were due to pneumonia, which accidental cause might follow any operation, therefore the mortality is to be reckoned as *nil*.

Indication is always present to operate if there are pressure symptoms, or if the growth is rapid: for cosmetic reasons operation is an open question; yet in view of no mortality the author favors it. The only contraindications are to be found in those afflicted with any organic disease; every other case ought to be operated upon. Where there were any respiratory or cardiac symptoms, Schleich's solutions, not cocaine, 1 per cent., were used.—*Beiträge zur klinischen Chirurgie*, Band xxv, Heft 2.

MARTIN W. WARE (New York).

II. Implantation of Costal Cartilage in the Larynx for the Cure of Severe Cicatricial Stenosis and Loss of Substance. By F. v. MANGOLDT (Dresden). In very marked cicatricial contractions of the larynx, dilatation is not only sadly ineffectual, but often results only in an aggravation of the condition. In such cases a good result may frequently be obtained through laryngotomy and continuous dilatation; but this method is unavailing in the severest cases, as it means condemning the patient to the permanent wearing of a canula.

The author has devised and successfully carried out the plan of increasing the lumen of the larynx by implantation of a piece of costal cartilage.

The patient was a child in her fifth year, affected with stricture of the larynx, dating back to operation in the first year for papilloma.

The operation consisted in the obtaining of a piece of the eighth costal cartilage of suitable dimensions, with careful preservation of its perichondrium; this was implanted vertically between the skin and subcutaneous tissue in the median line of the neck. Eight weeks later this combined flap was inserted between the alæ of the thyroid cartilage, the cartilage being secured by four points of suture to the hyoid bone above, and also to the alæ of the thyroid, laterally. The cartilage fragment remained attached to the skin, so that the fat tissue of this skin-cartilage flap was directed into the interior of the larynx, remaining to be covered over in the future by extension over it of the ends of laryngeal mucous membrane.

Dilatation now could be easily effected through the pre-existing tracheal fistula. An O'Dwyer tube is now employed, but it can eventually in all probability be dispensed with.

The case as above described is of interest from several points of view.

It furnishes an absolute proof of the feasibility of detaching a piece of costal cartilage, its perichondrium being retained, and incorporating it within the structures of the larynx after a preliminary successful implantation beneath the adjacent skin.

The piece of cartilage is still to be found in its place, one and a half years after implantation, as demonstrated by a radiograph.

Time must still elapse for the determination of the ultimate fate of this transplanted cartilage. Still, even should it not become a permanency, it will still have remained sufficiently long to bring about the desired displacement of the wings of the thyroid cartilage.—*Verhandlungen der deutschen Gesellschaft für Chirurgie, XXVIII Kongress.*

CHARLES L. GIBSON (New York).

CHEST AND ABDOMEN.

I. Heart Wounds and Suture of the Heart. By DR. C. A. ELSBERG (New York). While this series of experiments is conducted upon rabbits, they afford sufficient generalization of those principles which might guide us in the treatment of human heart wounds.

The rabbit can stand wounds of all sizes without immediate peril to life. Needle punctures cause temporary arrhythmia. The hæmorrhage is best controlled by digital pressure. Hæmorrhage is freer from the right heart than the left, and more pronounced in systole than diastole.

The second series of experiments elucidate facts concerning sutures of the heart wounds, and the phenomena are in part those of needle punctures. Non-penetrating sutures, *i.e.*, suture of the epicardium and a small layer of muscle, bleed less and are less likely to tear than those embracing much of the muscle, which tears and is apt to rend the endocardium also. Only when the wound is too large should the suture be deep. Furthermore, the suture is to be applied in diastole, since, if it is done in systole, the next diastole will cause the suture to be stretched and tear through the muscle. Three months later nothing abnormal could be detected in the heart's action.

Histological changes show cellular infiltration, degeneration of the muscle fibres, which are not subsequently regenerated, but replaced by connective-tissue cells; at the end of two weeks cicatricial tissue represents the line of wound, and everywhere the suture was surrounded by connective tissue.

In view of the lack of regenerative powers of the heart-muscle fibres, the sutures ought to be as few as possible, interrupted, and only penetrating the endocardium.—*Beiträge zur klinischen Chirurgie*, Band xxv, Heft 2.

II. Abdomen Obstipum (Congenital Shortening of the Rectus Abdominis). By DR. HABS (Magdeburg). Herein

the author narrates the history and successful operative interference for a most unique condition. An infant born of healthy parents, with no history of any injury during intra-uterine life and a normal delivery, was first seen in the fifth month presenting a stony, hard mass in place of the left rectus muscle. The ensiform process nearly touched the symphysis pubis, the lateral parts of the abdomen bulged out, suggesting enlarged kidneys. A month later malnutrition set in owing to the great diarrhoea and, in addition, prolapse of the rectum. Sternum was funnel-shaped, total kyphosis existed with lumbar gibbous, and the child always lay with the thighs flexed.

The progressive marantic condition due to prolapse occasioned by the diminished abdominal capacity constituted the indication for operation. A total extirpation of the left rectus was decided upon and performed in thirty-two minutes under A. C. E. narcosis. The posterior sheath of the left rectus was not adherent, and the folds in it, owing to the shortening of the muscle, straightened out after its removal. A tenotomy of the right rectus at two levels was still further requisite before complete extension of the body was possible. Immediately all aforesaid deformities disappeared, and the wound healed without any reaction. Six months later none of the deformities reappeared; the child is in robust health, and not at all hampered by the exclusion of the left rectus.

Microscopically, the entire extirpated muscle was represented by a fibrous mass, no muscle fibre being visible. While the author regards the etiology as obscure, he hints at the possibility of a neurotic or inflammatory (syphilitic?) basis for the condition.—*Zeitschrift für orthopädische Chirurgie*, Band vii, Hefte 2 und 3.

III. Experimental Researches upon Plastic Operations with the Omentum. By DR. ALEXANDER TIETZE (Breslau). The application of an omental stump about the line of suture of a hollow viscus (Senn) to guard against leakage, or its arrangement, for the purpose of excluding the peritoneal cavity, to favor

extraperitoneal drainage of the gall-bladder (Langenbeck), or to stop up a gap in a hollow viscus, *e.g.*, ulcer of stomach (Braun and Bennet), all of these constitute "omental plastique."

The author's efforts were mainly directed to the histological details of the aforesaid procedures. In the first set of experiments on dogs, a circular piece of stomach wall was excised and reinserted by suture, thus affording conditions favorable to a threatening perforation. Against this defect omentum was fastened. Result: the resected piece of stomach wall necrosed, and into the gap the omentum was wedged. In two instances the bowel was likewise treated, but here, while omentum was adherent, the gap was bridged over by intestinal wall.

In a second series of experiments, the omentum was applied about the bowel, subjected to an end-to-end anastomosis with deficient sutures (four). Death induced four weeks later finds the bowel united firmly, no adhesions anywhere, and the calibre of the bowel not constricted by adherent omentum. Again, in a third experiment, a defect in a stomach wall was obturated by a stump of omentum, and the post-mortem find eight weeks later was the same as in Series 1.

Histology: Agglutination with the peritoneum, cellular infiltration of the stump, and epidermization of the omentum, and, finally, cicatrization of the omentum which caused a contraction of the bowel lumen; furthermore, in operation on the stomach, the single layer of epithelium covering the omentum proliferated, and subsequently, by virtue of its innate properties, formed tubules.

Conclusions: Such plastic operations are everywhere in place when doubt is entertained as to the security of the line of suture about a hollow viscus.—*Beiträge zur klinischen Chirurgie*, Band xxv, Heft 2.

ORTHOPÆDIC.

I. Fat Embolism following Interferences of an Orthopædic Nature. DR. EDWIN PAYR (Graz). Bearing strictly in its relation to orthopædic manipulations, the occurrence of fat embolism will awaken new interest, since it is stated that nearly all the seven cases herein referred to followed some orthopædic manipulation or operation of the knee-joint (Eberth); yet one of the author's cases followed redressement of the ankle-joint. This latter, the first case, was a girl, aged fifteen, bedridden for seven months, afflicted with mitral insufficiency and chronic articular rheumatism. For a redressement of equinovalgus A. C. E. was given. The day following the temperature was subnormal, severe dyspnœa set in, moist râles in both lungs, and hæmoptysis, yet the senses remained clear until shortly before death.

Autopsy: Fat drops in the lung, pulmonary artery, left heart, liver, and kidneys. *Thymus persistens*, vast enlargement of the tonsils, and follicles at the base of the tongue, and large mesenteric glands and intestinal follicles.

In a second instance an operation was performed on an adult, aged thirty-eight, for the drainage of a gunshot wound of the head of the tibia. The next day dyspnœa, rapid pulse, high temperature, delirium, and coma developed.

Autopsy: Nothing in the brain, fat drops in the right lung and kidneys. *Thymus persistens*, lymphatic ring of the pharynx greatly hypertrophied. The last case, a girl of ten years, had a resection of the knee-joint performed; three days later similar symptoms, as in the preceding cases, developed.

Autopsy: Fat in the jugular veins and lungs. *Thymus persistens*, spleen enlarged, Peyer's plaques, enlarged and cheesy mesenteric glands.

Accordingly as the cerebral or respiratory disturbances predominate, the anatomical location of emboli may be foreshadowed.

Hæmoptysis, often accompanying the respiratory form, are due in part to hypostatic congestion of lungs.

The rôle played by the "Status Lymphaticus" in causing sudden death from accidents in themselves not mortal (Paltauf); its relation to sudden death during chloroform narcosis (Kundradt), and its influence in lowering resistance to acute illness (Ortner), lends itself admirably in accounting for death, when sudden circulatory disturbances supervene upon the entrance of fat emboli into the lungs, vessels, and brain. Further import may be given to this view because of the occurrence of these cases within one and a half years in a district (Tyrol) where *Thymus persistens* is commonly met with.—*Zeitschrift für orthopædische Chirurgie*, Band vii, Hefte 2 und 3.

II. Laminectomy for Pott's Paraplegia. By DR. F. TRENDLENBURG (Leipzig). The author believes the unfavorable opinions generally held regarding the value of this operation are unwarranted. He has performed this operation eight times in the last four years. The ages of the patients were respectively nine, eleven, fourteen, seventeen, eighteen (three), and thirty-six years. In most cases the carious process was cured, the others were well advanced in healing; in the most recent case the disease had existed two years. In only one patient was the paralysis of recent date, in the others not less than six months, and in one case of seventeen years' duration. The paralysis was for the most part of the spastic type; in one case of epidural abscess there was complete sensory and vesical paralysis; otherwise the cases presented but little if any disturbance of sensation or of the functions of the bladder and rectum. The exciting cause of the paralysis was found to be, abscess 1, cheesy focus in the spinal canal 1, granulation tissue of a peri-pachymeningitis 1, abnormal narrowness of the canal from a kyphosis without other changes, 5 times.

In resecting the laminæ, a curved lateral skin-flap was made. The bone was divided with Luer's forceps, a chisel being used.

Healing by primary union was always obtained. No death occurred as a direct result of operation. One boy died seven months later without giving any evidences of improvement. All the other patients still live.

The result of operation as manifested by an improvement of the paralysis was evident in half of the cases in the first few days or weeks, in the others there was either no change, or, even after very cautious procedures, a change for the worse, probably due to œdema of the spinal cord, and directly after operation a transformation of the spastic into a flaccid paralysis, and vesical disturbances supervened or were exaggerated. This unfavorable state then passed off in a few weeks and improvement gradually took place. A veritable improvement as contrasting with the previous condition was noted from three to nine months later. In only two cases was there no improvement, in the remainder the end result was good. Complete or very nearly complete cure was obtained four times, although in one of these, a case of epidural abscess, there was a temporary remission with development of a new abscess. Two patients are still under treatment, one is already distinctly better.

The author thinks that these results have not been obtained because the improvement of the paralysis might already have been established before interference. Such an improvement is in his experience the exception.

The author thinks that these results have not been obtained, plete or very nearly complete cure of the active process accompanied by paraplegia in which the pressure is pretty clearly due to a small abscess or a cheesy focus, or, what is a more frequent cause than is generally known, to a narrowing of the canal at the point of the greatest bending of the spinal column. That the paralysis (if incomplete) has existed a long time, seventeen years in one case, is no contraindication to operation.—*Verhandlung der deutschen Gesellschaft für Chirurgie, XXVIII Kongress.*

CHARLES L. GIBSON (New York).

THE LEUCOCYTE COUNT IN SURGERY.¹

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THE pathology of leucocytosis is as yet in a chaotic state. Where an increase in the number of leucocytes is found in the blood, some hold that the number of leucocytes in the body has been increased, while others hold that there is no increased production, but that a greater number has found its way into the circulating blood. Even the normal site of origin of certain leucocytes is still an open question. Some regard the bone-marrow as the source of all forms of leucocytes, while others cling to the view that the lymphocytes originate in the lymph glands and lymphoid tissues. Though the pathology is so uncertain, enough has been established empirically to make the leucocyte count of great value to the surgeon.

In weighing the significance of a leucocyte count, regard must be had to certain influences which cause it to vary. One of these is the digestion of proteid substances. While the usual count in a healthy adult is from 5500 to 7000 per cubic millimetre, a few hours after a hearty dinner the count may normally be from 10,000 to 13,000. There are, however, exceptions; some individuals show little or no digestive leucocytosis. Age also has an influence; during the first few years of life a count of 10,000 to 12,000 is not abnormal. Large hæmorrhages are usually followed by a marked leucocytosis. This is said to disappear again within a few days. It may be

¹ Read before the New York Surgical Society, March 14, 1900.

succeeded by an abnormally low count, such as is often found in severe anæmias not the result of hæmorrhage. In a case of severe hæmorrhage from the stomach examined four days after cessation of bleeding, I found the red corpuscles 1,100,000, hæmoglobin 25 per cent., and the leucocytes nearly 9000. They had presumably been very much higher shortly after the hæmorrhage. At five-day intervals I found the leucocyte count sank as follows: nearly 6000, a little over 4000, 2500. It then began to rise. Meanwhile the hæmoglobin showed faint increase, and the red corpuscles increased steadily about 300,000 every five days.

After ether operation of any magnitude, the count is, as a rule, much increased. I have made counts before and after operation in eight aseptic cases. The highest count was 29,000, made two and one-half hours after operation. The next day it had dropped to 13,700. Every case examined within a few hours after operation showed a marked rise, corresponding closely with the duration of the operation. The influence of a circumcision operation on a child three years old, where the patient was under ether for only a few minutes, was so slight that the count rose only from 11,600 just before operation to 12,000 four hours after operation. The next day it was 2000 less than before operation, probably owing to the restricted diet. In some of the cases the count was made for several days following operation, and in all it showed a progressive reduction. I think we may conclude that an ether operation causes an immediate increase in the leucocyte count, and that this recedes steadily in the course of the next few days.

The influence of ether operations in septic cases, where the operation is done for the relief of the septic condition, seems to vary. In the case of a two-year-old child with tubercular finger and tuberculosis of the os calcis, with apparently acute infection, the count just before operation was 23,400. I amputated the finger and curetted the os calcis. Instead of rising, the count had dropped slightly four hours after operation. At the end of two days it had sunk to 12,-

400. In an appendicitis with abscess, the count just before operation was 12,200. An hour after operation it had risen to 14,200, and the next day had receded to 11,700. An acute cervical adenitis in an infant of seven and one-half months, with a count of 19,800 just before operation, showed the next day an increase to nearly 20,800. The following day it had dropped to 15,500, and the next to 11,600. I think we may conclude that after operations for the relief of sepsis the count will vary greatly in individual cases. Relief of the sepsis will tend to send it down, while the ether will tend to send it up. From the few cases I have examined, it seems to me that where there is already a leucocytosis from sepsis, ether has less influence to raise the count than in cases where the count before operation is normal. At all events, the effect of the ether is so evanescent that, if the case is doing well, the count should drop markedly in the course of a day or two.

On the basis of only one case, I am inclined to think that the absorption of iodoform, or the iodine liberated from it, may cause a very marked leucocytosis. The patient was a man twenty-one years old. He had had an iliopsoas abscess for several months. The pus was drawn off by aspiration and two ounces of 10 per cent. iodoform-glycerin injected. One week later I found his leucocytes 12,400. Three days after that they were 11,900. Three days later the cavity was again aspirated and five ounces of 2 per cent. iodoform-glycerin injected. The next day I found the leucocyte count had shot up to 28,300. There were no local signs of acute inflammation. The urine showed a very marked iodine reaction with chlorine water and chloroform. Later the same day the abscess was incised under cocaine and a drain put in. Cultures made at the operation failed to show any growth. The following day the leucocyte count had dropped to 13,800. One case is not enough to prove anything, but the presumption is that the absorption of iodoform or iodine may cause a very marked leucocytosis.

So much for leucocytoses which may be expected to result from surgical procedures.

Carcinomata apparently have a tendency to increase the leucocyte count. This does not, however, seem to apply to the early stages when a significant count would be of value. Carcinomata which are growing rapidly or producing metastases are reported to produce, as a rule, a distinct leucocytosis. But the rule has too many exceptions to make it of much value. I have made counts in three cancer cases. An inoperable medullary cancer of the breast showed 7900. A recurrent cancer of the breast showed 11,950. An inoperable cancer of the cervix with surrounding infiltration showed 7900. These counts show only a slight upward tendency from the normal, and all were somewhat exposed to infection from ulceration.

Some interest attaches to cancer of the stomach. Many observers have noted an abscess of the digestion leucocytosis in cases of cancer of the stomach. Cabot reports that out of thirty-seven cases examined at the Massachusetts General Hospital only three showed any digestion leucocytosis. Other writers furnish figures in harmony with these. I have examined but one case. After a hearty meal the count rose from 5929 to 6538, an increase of only 609; whereas the usual digestion increase is several thousands. As a diagnostic sign, however, the failure of digestion leucocytosis is of only secondary value; for it often fails in chronic gastritis, in dilatation of the stomach, and sometimes in people of sound health. In gastric ulcer, digestion leucocytosis is usually present. Finding it would rule in favor of ulcer and against cancer.

Sarcomata are nearly always accompanied by a well-marked leucocytosis. In most cases the increase is in the polymorphonuclear neutrophiles; but Dieballa reports a case of multiple sarcoma beneath the skin where repeated differential counts showed over 9 per cent. of lymphocytes. The leucocytosis varied between 20,000 and 34,000.

The best service which the leucocyte count renders the surgeon is in the diagnosis of acute inflammatory conditions. Let me instance a few cases with their leucocytoses: Streptococcus adenitis in a seven and one-half months' infant, 19,800.

Mastoid abscess in a six months' infant, 24,800. Circumscribed pneumococcus empyema in an eighteen months' boy, 18,900; two days later 20,500, when I operated. Cellulitis of hand and forearm in an adult, drainage insufficient, 17,400. Cervical abscess and cellulitis of leg in an adult, 17,500. Indolent ostitis of tibia with sinus in an adult, 16,900. Necrosis of upper jaw, 18,800. In this case there was profound anæmia, hæmoglobin 30 per cent., red corpuscles 1,191,000. This anæmia did not hinder the leucocytosis. Appendicitis 17,000, rising next day to 19,000. At operation, appendix partly gangrenous. The above instances are typical of the counts in pus cases which are relieved by early interference.

In most cases, other influences being excluded, the leucocyte count is a safe guide to the presence of acute suppuration; but in some instances the count is not strikingly high. In such cases I would emphasize the importance of making two or more counts at intervals to determine whether the tendency is upward or not. In the early stage of appendicitis, a stationary or downward tendency may point to the advisability of delaying interference to a period of quiescence; while a mounting leucocytosis may be the only, and a sufficient, reason for operating. A post-operative appendicitis case which I followed showed well the meaning of a progressive rise in the count. The day after operation the leucocytes numbered 11,700. The following days they were successively 14,500, 16,900, 22,100. Meanwhile the dressings, temperature, pulse, and respiration gave no distinct indication of anything wrong. At the next dressing a large quantity of pus found its way into the wound. Unfortunately, I was not able to make any further counts in the case.

Perplexing instances arise where, in the presence of severe suppuration, there is no leucocytosis. This happens usually in patients who are greatly prostrated, either by the sepsis itself or from other causes. In cases of great prostration, an absence of leucocytosis does not exclude the possibility of sepsis, and a negative count should simply be left out of the

reckoning. But though the count fail us here, the quality of the leucocytes may prove of diagnostic value.

The leucocytes may help us to infer the presence of a suppurative process not only by their greater abundance, but also by qualitative changes which they exhibit. In cases where a progressive suppurative process is present, a larger or smaller proportion of the polymorphonuclear neutrophiles stain with iodine. This reaction is not found in normal blood, and is said not to occur in any diseases which could well be confounded with acute abscess.

This subject has been investigated during the last few years, notably by Livierato and by Goldberger and Weiss. Their results are harmonious. The procedure is not too difficult to be clinically available. As the leucocyte count is in some pus cases so low as to throw no light upon the presence of suppuration, this other means of determining its presence may prove of the greatest value. The technique is as follows: Cover-glass smears of the blood are prepared in the usual manner and allowed to dry spontaneously. The staining fluid consists of iodine one part; potassium iodide, three parts; water, 100 parts; gum arabic sufficient to produce a syrup-like consistency. Two or three drops of this are placed on a slide, the cover-glass floated on it, and after a few moments the excess of fluid withdrawn by a bit of filter-paper applied at an edge of the cover. The specimen is then ready for examination by an immersion lens. Air-dried blood smears retain their susceptibility to iodine for several weeks.

The red corpuscles have a dark yellow color; in normal blood all of the leucocytes are much lighter than the reds. In the blood of progressive suppurative cases, the protoplasm of a certain proportion of the polymorphonuclear neutrophiles takes on a reddish-brown coloration. The mode of coloration differs in different leucocytes: in some it is a diffuse stain; in some a granular net-work; while in others the color is confined to large or small refractive granules, varying in tint from a light pink to a dark red. The intensity of the reaction is said to be closely related to the acuteness of the pus

process, being most intense in rapidly progressive streptococcus and staphylococcus phlegmons. The size of the abscess is, however, of little influence; very small abscesses may give a distinct reaction. In tubercular abscesses the reaction is absent. Acute abscesses which are well walled off and have assumed an indolent course rarely give a reaction. If, however, such a process lights up again, the iodine reaction will return. Goldberger and Weiss, from an examination of a considerable number of cases of other diseases as well as of abscess, reach the conclusion that a distinct intracellular iodine reaction, even if made out in only a few leucocytes, warrants the conclusion that there is a progressive suppurative process. Such a conclusion does not, however, hold in the presence of pneumonia, for they and other observers have found the reaction constant during the progress of lobar pneumonia. Still further reservations must be made in view of observations by Hofbauer at Neusser's clinic in Vienna, published only last month. He found that in certain grave blood diseases the iodine reaction was present. In seventeen cases of chlorosis he failed to find it. In eighteen cases of secondary anæmia he found it in two, but one was complicated by pyothorax and the other by gonorrhœal adnexa. In really grave anæmias, however, as in that associated with cancer of the stomach, severe chronic intoxications, etc., where the blood picture approached that of pernicious anæmia, he regularly found a greater or less number of iodophile leucocytes in the seven cases he examined. In advanced pernicious anæmia and in leukæmia he also found it. Hofbauer concludes, therefore, that where intracellular iodine reaction is present, before the diagnosis of a progressive suppuration can be established, the presence not only of pneumonia, but also of grave blood diseases, must be considered. His findings do not seem to me to lessen the practical value of this test.

Besides the intracellular iodine reaction there is also an extracellular reaction. This shows itself by the staining of granules of various sizes which are usually enclosed in masses

of yellowish *débris*. These extracellular granules occur sparingly in normal blood. Where the intracellular reaction occurs, these extracellular granules are usually increased; but after fractures, extensive bone operations and contusions with hæmatomata, a great increase is found of the extracellular forms alone. These appear in from six to forty-eight hours and vanish in a day or two more. Later, a moderate intracellular reaction has sometimes been observed, but only where there was an accompanying fever.

This iodine reaction can be readily seen in smears of pus. The protoplasm of some of the leucocytes takes the red-brown coloration, a large proportion of them contain the refractive red-brown granules, and the field is often strewn with such granules lying outside the cells. My own observations with this test lead me to feel that a thorough trial should be made of its value to the surgeon. Let me instance two cases.

D. K., aged seven and one-half months; adenitis of neck; symptoms not acute. There was no history, and at first I thought the gland tubercular. Leucocytes 19,700. Iodine reaction very striking in some leucocytes. At operation, I found the gland had broken posteriorly, and my finger passed in the pus cavity between the spine and the top of the trachea. Pus showed streptococci.

A. M., aged thirteen years; appendicitis. Right iliac pain for five days. Leucocytes only 12,200. Iodine test shows diffuse staining of many leucocytes, a few contain brilliant iodophile granules. At operation a considerable amount of pus was found. Here the leucocytosis was low, but the iodine reaction pointed to pus, which was found at operation three hours later.

A question of special interest is this: In those cases of severe suppuration where leucocytosis fails, will the iodine reaction be present? If so, it will be an invaluable aid to diagnosis in certain critical cases. I have placed beneath microscopes examples of the various forms of iodine reaction. The first specimen shows polymorphonuclear neutrophiles in normal blood. The second is blood from a case of circumscribed pneumococcus empyema. It shows an eosinophile,

unstained; a polymorphonuclear which is barely tinged, and another rather deeply stained. The third is from a case of streptococcus cellulitis with abscess. It shows a leucocyte with diffuse browning of the protoplasm. The fourth is from an appendicitis with abscess, and shows a red-brown granular net-work in the protoplasm. The fifth is from a lobar pneumonia, and shows a large extracellular iodophile granule. The sixth is from an acute tenosinovitis and cellulitis of the hand and forearm. It shows several refractive iodophile granules in the protoplasm.

A few words as to the technique of blood-counting may not be out of place. I have used the Thoma-Zeiss instrument. After use, the mixing pipette should be cleansed by drawing up distilled water three times, alcohol three times, and ether three times. Sucking air through will evaporate the last traces of ether and leave the pipette clean. The counting-chamber and cover-glass should be washed with water and polished with a handkerchief. The cover may be further cleaned with alcohol, but no alcohol should be used on the slide for fear of injuring the cement. After drawing up the blood and diluting fluid, I shake the pipette one hundred times to insure thorough mixing. About a third of the fluid is expelled and the tip of the pipette wiped before placing the drop upon the slide. Slide and cover must be so spotlessly clean that slight pressure will cause iridescence wherever they touch, and this iridescence should remain when the pressure is removed. I am in the habit of cleaning both slide and cover and inclining them, bottom up, against some object before drawing the blood, in order that there may be the least possible delay in getting the mixed blood upon the slide and the cover applied. Where only the four hundred squares in the chamber are counted, even with careful work the errors may be considerable. I make it a practice to count also the area included in the outlying parallel lines, having determined by means of a micrometer eye-piece and micrometer slide the size of this area in terms of a small square. In my instrument, the four hundred small squares, together with the outlying areas in-

cluded in the parallel lines, are the equivalent of 1970 small squares. I have found it convenient to determine the factor which multiplied by the number of leucocytes counted will give at once the number of leucocytes per cubic millimetre. I use by preference a one-tenth dilution, and for this the factor is 20.3045.

In conclusion, I would lay particular stress upon this: that although the leucocyte count may be made by some one else, yet the bearing of this count upon the case in hand should be interpreted by the surgeon in charge. As the findings of the thermometer taken by themselves give no specific information, so it is with this mode of examination.

I have spoken of some of the many influences which may modify the leucocyte count. Only he who is best informed as to all aspects of the case can give to the count its due place in the diagnosis or prognosis.

PERMANENT (CONGENITAL) DISLOCATION OF THE PATELLA.¹

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APPEL, of Munich, in an interesting paper published some years ago, has given the result of his study of this rare condition. A case recently under my care, and a study of some others not mentioned by Appel, enable me to support the views which he urges with regard to the nature of the dislocation, and to indicate the best method of treatment, a matter which he does not touch.

The dislocation in a displacement of the patella outward, so that it lies, even in extension of the knee, in most cases to the outside of the middle line, and in flexion it slips outward and backward till it lies on the outer surface of the external condyle of the femur, its anterior surface directed partly outward, the patient's gait is most insecure, and frequent falls and synovitis of the knee are the result.

I believe that in most cases a fall and consequent injury to the knee first direct attention to the condition, and indeed may increase the dislocation to a certain extent; but it really depends, as Appel holds, on a congenital defect, viz., a deformity of the external condyle and trochlea of the femur. The grounds for this view will appear.

In most of the cases recorded, one or other of the following conditions will be found: (1) the dislocation, or some

¹ Read before the Medico-Chirurgical Society of Edinburgh, January 17, 1900.

accompanying deformity actually noticed at birth, (2) the late age at which the child learned to walk, or else insecurity in walking during childhood, (3) rachitis, (4) genu valgum, (5) outward rotation of the leg, (6) ill-developed patella, (7) abnormality in the shape of the external condyle and patellar fossa of the femur.

With regard to my own case, I have made the following notes.

I. M., aged nineteen, a domestic servant, was admitted to hospital on May 29, 1895. Her mother states that she never walked securely like other children, and, in fact, could not be said to walk much at all till she was seven years of age; that she was never able to run, and was continually falling, and that she developed knock-knee on the left side. Three months before admission, she fell going upstairs, "her leg seemed to give under her," and she fell quite helplessly. She had fallen frequently since in the same helpless manner, and had been laid up in consequence more than once with synovitis of the knee.

She is a healthy-looking girl, but with evidence of rachitis in childhood; very short and clumsy figure. Marked genu valgum on the left side; the leg is rotated outward. When the knee is extended, the patella lies somewhat to the outside of the normal position; when the joint is flexed, it passes farther and farther out till it lies on the outer side of the external condyle of the femur, its anterior surface directed outward and forward. It may with force be held in or near the middle line while the knee is being flexed to a certain extent, but on being released it flies out and back. The fossa patellæ of the trochlear surface of the femur can be felt to be partially filled up, as it were, on its outer side, as if the external condyle projected into it, while the outer edge of that condyle, on the other hand, seems to fail altogether and leave a gap under the outer edge of the patella. The Röntgen rays show the position of the patella to be higher up the femur than normal, and give a faint indication of the altered shape of the external condyle.

Appel, including two cases of his own, gives thirty cases. Of these, unfortunately, twelve make no mention of the con-

dition of the femur; of the remaining eighteen, fifteen had a deformity of the femur, while in three that bone was said to be normal. The notes of Appel's two cases are as follows:

(1) A woman, aged forty; as a child, late in learning to walk; nine weeks before admission to hospital fell in the harvest-field and injured her left knee; since then complained of weakness in standing with the knees flexed, and especially in descending a stair. Patella smaller and rounder than normal; slips back outside the external condyle on flexion. Groove on the femur for the patella shallow and narrow, due to the edge of the trochlea being broad and rounded; its normal sharp ridge lost; outer side of the external condyle slopes away instead of falling away sharply. Slight genu valgum. Leg rotated outward.

(2) A man, aged twenty-six, a porter. "Double-knee" remarked at birth. Has felt his left knee weak on descending a hill with a heavy weight on his back; no history of a fall. Patella lay in external condyle of femur, and slipped out and back on flexion of the knee. Groove for patella narrow. Slight genu valgum. Leg rotated outward.

The same characters appear in one or other of the remaining cases collected by Appel. Thus, in Uhde's case the fossa patella was too narrow, and the ridge of the external condyle bounding it was not so prominent as usual. Stokes, Smith, and Servier each records a case in which the abnormality is described as an absence of the external condyle. Lannelongue mentions a very small patella and a diminished trochlear surface for it. Janicke records smallness of the external condyle, shallowness of the fossa patellæ, and rickets.

I have collected some cases not recorded by Appel. Wright records of his patient, a girl seven years old, that she did not walk till she was three years of age; some months before he saw her she had fallen while dancing, and had been constantly falling since; the patella was smaller than normal, but he describes the external condyle as "very prominent," possibly referring to its invading the fossa patellæ. There

was the usual dislocation of the patella. In Pollard's case, the patient, a woman aged twenty-one, could not fix the period at which her patella was displaced, but the limb had been "weak since childhood." A few weeks before being examined she slipped and fell, and had been lame since; there was marked genu valgum, the patella was smaller than usual, and lay on the outer side of the external condyle during flexion of the knee; when he operated, he found the trochlear surface of the femur "exceedingly small in all its dimensions," and the groove for the patella very narrow. In Goldthwait's case the patient was a woman thirty years of age; both patellæ were dislocated, and the deformity had been noticed since she was a child; the leg was markedly rotated outward. In Canton's case (first mentioned in Appel's list) there was the usual dislocation of the patella, knock-knee was present, and the external condyle "did not project anteriorly to its wonted degree." He continues quaintly,—reversing, apparently, the cause and effect,—“The dislocation of the bone was noticed at birth, but was not believed to be of any importance; and now the external condyle has become so worn away that the case is beyond the reach of surgical art.”

It has been pointed out that the quadriceps in passing from its origin to its insertion forms an obtuse angle, at the point of which the patella lies. In action, it would pull the patella outward till it came to lie in a straight line between the origin and insertion of the muscle, were this not prevented by the obstacle which the prominence of the external condyle presents. The ridge of the external condyle keeps the patella in the middle line. Should the fossa patellæ be too shallow, or the ridge of the external condyle not be prominent enough, the patella will lie dangerously far out on the trochlea,—a case of slight dislocation. It then only needs a severe contraction of the muscle or a slight trauma to shoot the patella off the front of the condyle altogether, and bring it to lie on the outside of the femur (Appel). Or, in cases in which the condyle is markedly deficient, the complete dislocation may exist from birth or the first years of life. In any case,

the structures on the outer sides of the patella eventually contract and prevent the possibility of the bone retaining its proper position. It is natural to ask the question, What is the connection between rickets and this dislocation? But it is not easy to give an answer. In some cases it is possible that both the knock-knee and the outward rotation of the tibia are produced by the abnormal line in which the quadriceps comes to work.

As regards the treatment of this condition, we find, as we might expect, various methods adopted. Roux (in a traumatic case) divided the vastus externus, detached the ligamentum patellæ, and nailed it farther inward to the tibia. Goldthwait, in his bilateral case, adopted a similar procedure in treating the one knee; while, on the other side, he detached the tubercle of the tibia and nailed it farther inward; he gives the preference to the latter method. On both sides he divided the outer part of the capsule to allow the patella to be drawn inward. The result was good. Lucas Champièrre performed a more severe operation. He opened the joint, cut a groove on the surface of the femur, and fixed the patella in it by suture. Bilton Pollard followed this idea. He corrected the genu valgum by osteotomy, but the patient's walk was no more secure. To correct the dislocation, he made first an external incision through which he divided the insertion of the vastus externus and the outer part of the capsule; through an internal incision he chiselled out a groove in the cartilage and bone of the femur "till a sufficiently broad and deep trochlear surface was made." The patella placed in this slid up and down normally in flexion and extension of the knee. Lastly, he excised a piece of the capsule on its inner side, and braced up the joint. Result after a month the patient walked well, and said her knee was stronger and more serviceable than before the operation. Wright adopted a much simpler procedure, and one that was followed by a good result; it resembles the operation I performed, which I shall now describe.

I had not seen any record of similar cases, nor of the

methods of treatment, but, if I had, I do not think that I should have preferred any of them to that which suggested itself to me. It consisted in liberating the patella by dividing on the outside whatever contracted structures prevented its assuming its normal position, and then mooring it there by sutures passed through its inner border.

On June 8 I corrected the knock-knee by an osteotomy; but when the patient began after the usual period of rest to go about again, she complained still more of insecurity in walking,—possibly due to some atrophy of the quadriceps. On September 3 I made a U-shaped incision over the knee, and turned up a flap of skin. I divided on the outer side of the patella the expansion of the quadriceps tendon and the capsule—but without opening the cavity of the joint—so as to allow the patella to be brought easily to the middle line. I then bored two holes through its inner edge, and, having passed a stout catgut suture through each, I fixed the patella in its place by stitching it to the internal lateral ligament. The wound healed by first intention, but the sutures were not strong enough, and I had the annoyance of seeing the patella gradually slip back to its old position. About eight weeks later I performed the operation again, precisely as before, using this time, however, stout silk instead of catgut sutures. There was again an uninterrupted recovery, and the patella remained in its normal position. The operation was followed, however, by a most marked and prolonged atrophy of the quadriceps and corresponding uselessness of the limb. For a long period afterwards, if she were lying down, the patient would raise her heel off the couch only if the knee-joint were extended. The limb, however, under massage, electricity, and exercise, gradually gained strength, though for months she had to walk with care.

On November 30, 1899—four years after the operation—I examined the knee. The patella has retained its position, slightly external to and higher up than normal, and the patient walks and goes up and down stairs with confidence, having lost all fear of falling. Wishing further to test her, I asked if she

could run. She replied with a laugh that recently she had won the third prize in a race at a picnic.

This method of treatment, then, seems rational and effective, and should succeed in most cases. It is possible, however, that the severer procedure of opening the joint and enlarging the groove for the patella might in some cases be necessary; while, again, transplanting the ligamentum patella inward should be reserved for cases where the outward rotation of the leg exists to a high degree.

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INTERSCAPULO-THORACIC AMPUTATION FOR OSTEOMYELITIS OF THE HUMERUS.¹

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E. A. G., aged thirty-nine, was admitted to the Methodist Episcopal Hospital under my care with the following history: Four years ago he fell from his wheel, striking upon the point of the left shoulder. Shortly after this he noticed an occasional sharp pain in the shoulder region on motion. He sought advice of a so-called "osteopathic doctor," who subjected the shoulder-joint to forced manipulations, under which the trouble became decidedly worse, when the treatment was abandoned. Antirheumatic treatment was then instituted without result; and, finally, one and one-half years following the first appearance of the symptoms, he sought advice in one of the metropolitan hospitals. Here the parts were immobilized by means of plaster-of-Paris for five weeks, without relief to the symptoms. One week after the removal of the plaster-of-Paris dressing an abscess formed in front of the joint; this opened spontaneously. Other abscesses followed, which were opened and the parts curetted. Healing followed. The parts remained healed for six months, when another abscess pointed in the cicatrix. This was incised; but others soon followed, due to pocketing of pus, which, in time, were opened up and curetted, but with comparatively little relief.

Upon admission the patient complained of pain upon motion, and consequent loss of function of the shoulder-joint. Atrophy of the deltoid was marked. Examination revealed a sinus discharging on the outer aspect of the arm, three inches below the

¹ Read before the New York Surgical Society, January 10, 1900.

level of the articulation of the shoulder, and in the line of an old cicatrix. This communicated with three separate pockets,—the first anteriorly and on the same level with the sinus; the second anteriorly and below; and the third posteriorly on the dorsum of the scapula. The movements of the shoulder were limited in all directions.

On May 30 a three-inch incision was made upon the outer aspect of the arm just below the shoulder-joint, opening up the cavity into which the sinus led directly; from this the other two cavities or pockets were traced, and each, together with the communicating sinuses, freely incised. All determinable infected tissues were removed by means of the sharp spoon. No rough or denuded bone was discovered at this time.

On the third day, a profuse purulent discharge having occurred in the meanwhile, another careful exploration was made, with the result that a small point of rough, bare bone was discovered near the upper angle of the wound, apparently in the neighborhood of the neck of the humerus.

On June 8, nine days after the preceding operation, the cavity of the shoulder-joint was opened by extending the vertical incision previously made in an upward direction. The head of the humerus was found to be the seat of extensive disease, almost half of its structure having disappeared, while the remainder was soft and broken down. The bone was freed from its attachments and section made at the surgical neck with the Gigli-Haertel wire saw. The contents of the medullary cavity were evidently diseased; but, inasmuch as consent to amputation had not been obtained, the expedient of curetting the entire length of the medullary canal was resorted to, an opening having been made at its lower extremity for facilitating the curettage and providing for efficient drainage. A 10 per cent. emulsion of iodoform in glycerin was forced through from the upper to the lower opening after curetting and "scouring" the walls of the cavity by means of iodoform gauze. Through and through drainage was then established by means of gauze strips.

Marked improvement followed this procedure. The iodoform gauze drain was changed daily and the medullary canal irrigated. The applications of iodoform emulsion were repeated several times. In the course of a fortnight the discharge from the medullary canal had apparently ceased, when the gauze drain

was permanently withdrawn. The patient left the hospital at the end of five weeks, and continued to gain rapidly in strength and flesh, although, in spite of curettage and antibacterial local treatment, the sinuses in the soft parts remained unhealed, discharging but slightly.

Three months later he again entered the hospital. The history in the interval included a thrice-weekly curettage and dressing of the infected sinus and the incision and evacuation of several abscess cavities in the soft parts about the shoulder and scapular region. A peculiarity of these latter was the suddenness with which they made their appearance; a puffiness of the parts would occur, followed in a few hours by rapid breaking down with marked constitutional disturbance. An examination at this time showed a renewal of the disease, with a separation of the upper third of the bone (pathological fracture).

On August 29 amputation at the shoulder-joint was performed. The glenoid cavity appeared healthy, and no further osseous disease could be made out. It was impossible, however, to obtain the requisite flap material without utilizing to some extent the soft parts which, from time to time, had been the seat of infection; although all existing sinuses were carefully dissected out, and the openings thus made in the flaps utilized for drainage.

The recovery from this operation was prompt; the flaps united without appreciable disturbance; and so rapidly did he regain his strength that he insisted upon leaving the hospital on the twelfth day. At this time the drainage openings were reduced to small sinuses, which gave promise of speedy closure.

An examination of the humerus after removal showed the entire bone the seat of an osteomyelitis, this even invading both condyles. The elbow-joint, however, was not involved.

Ten weeks later, on November 7, the patient was admitted to my service at the Brooklyn Hospital with an extensive recurrence of infection in the flap covering of the glenoid cavity. The sinuses had been regularly dressed with iodoform and Peruvian balsam gauze, and occasionally curetted. There was still the same history of rapid improvement, followed by sudden and unexpected relapse due to the occurrence of foci of infection which presented the features of rapid growth and necrosis of tissue, with constitutional disturbance.

On October 7, the infected soft parts were embraced by an elliptical-shaped incision, with the major axis of the ellipse vertically placed; this included the entire amputation flaps of the previous operation. The glenoid cavity and outer end of the clavicle thus exposed were then cleared, the outer fifth of the last named removed, and the scapula sawn across at its surgical neck. With the exception of an erosion here and there of the cartilaginous covering of the glenoid cavity, the bone removed appeared to be healthy. This removal of bone fulfilled its object of permitting coaptation of the edges of the large wound made by the sweeping incisions which cleared away the infected area made up by the flaps of the shoulder-joint amputation.

Rapid improvement again ensued, and in two weeks the patient left the hospital. The operation wound closed completely, and there was reason to hope that at last the infection had been removed. This hope was short-lived, however, for, after ten weeks of quiescence, it reasserted itself with apparent renewed virulency. The soft parts, including the supra- and infra-clavicular regions, were suddenly and venomously attacked; the first intimation of this being a stiffness of the shoulder and neck muscles. This was followed by chills, headache, and rise of temperature. Within twenty-four hours the involved parts became the seat of a brawny and painful swelling, this being particularly marked beneath the clavicular attachments of the pectoralis major muscle.

He was readmitted to the Methodist Episcopal Hospital on December 5, 1899, and consecutive interscapulo-thoracic amputation completed by the removal of the remaining portions of the clavicle and scapula. The incisions employed were practically those of Paul Berger, save that, owing to the extensive and extreme septic conditions present, these were placed at a somewhat greater distance, both anteriorly and posteriorly, from the point of the shoulder than the lines laid down by that surgeon. The infection was found to have extended beneath the pectoralis major muscle, and a lemon-sized septic cavity containing pus and the *débris* of necrotic tissue found below the clavicle and in the direction of the sterno-clavicular articulation.

It was deemed impracticable; on account of the septic conditions in the neighborhood of the vessels, and perhaps unnecessary, owing to the previous amputation of the arm and ligation

of the axillary artery, to ligate the subclavian preliminarily. In order to reach all portions of the extensively infected area upon the chest wall in front, it became necessary to turn down an anterior flap consisting of skin, fat, fasciæ, and pectoralis major muscle. An indurated mass in the thickness of this flap was found ready to break down; this was dissected out. Other demonstrable but smaller foci of infection were similarly treated. An area surrounding an old sinus in the posterior flap was also cut away.

The entire raw surface of the flaps, as well as the infected area upon the chest wall, was then carefully swabbed with a 2½ per cent. solution of formalin in equal parts of alcohol and water. The site of the suppurating cavity was packed with gauze wrung out of the same solution, a few silkworm-gut sutures placed at the lower angle, and the remainder of the extensive wound cavity lightly dressed with sterile gauze wrung out of equal parts of alcohol and water.

There was considerable loss of blood attending the operation, particularly that portion involving the removal of the scapula, and this, together with the patient's unfavorable condition owing to repeated relapses of sepsis, made it necessary to perform intravenous infusion during the operation, sixty ounces of normal saline solution at a temperature of 120° F. being employed.

The patient reacted well from the operation. The formalin alcohol dressings were removed at the end of twenty-four hours and simple alcohol and water dressings substituted. These were covered by a layer of oil-silk, and a trap-door cut through this and the retaining bandages in order to occasionally reinforce the dressings with the same mixture. This treatment was continued for another twenty-four hours. At the end of this time it was found that a slight superficial sloughing of the raw surfaces had been occasioned by the formalin application. This rapidly separated under powdered naphthalin and Peruvian balsam dressings; and in a week from the day of operation a healthy granulating process was in progress when the wound edges were coaptated by broad strips of adhesive plaster. In the meanwhile it had become necessary to remove the few sutures placed at the inferior angle of the wound, marked infection having occurred along the track of the silkworm gut.

The patient gained rapidly in strength and was thoroughly

convalescent in a fortnight. Examination of the bones after removal revealed the usual conditions present in osteomyelitis. The sawn surface of the clavicle and scapula made at the previous operation had evidently become the starting-point of a reinfection of bone from the already present infection of the soft parts. This had followed the cancellated structure far into the bone. This was cultivated at room temperature, and gave a slow growing and liquefying organism. This was placed in the hands of Dr. Ezra Wilson, Director of the Bacteriological Department of the Hoagland Laboratory. Dr. Wilson put the culture through subcultures on different media and found it to be a facultative anaerobic, liquefying, slightly chromogenic staphylococcus, corresponding in its morphology and cultural characteristics to the *staphylococcus pyogenes albus*.

In reflecting upon the conditions present in this case, which necessitated the final resort to what is usually regarded as an extremely mutilating procedure, there can be no two opinions as to the justification for the latter. In fact, in the light of the experience gained, I can but regret that it was not resorted to earlier. It is my present belief that interscapulo-thoracic amputation could have advantageously substituted the amputation at the shoulder-joint. This is based upon the line of reasoning that has impelled surgeons more recently—notably Professor Keen, of Philadelphia, and Dr. Russell S. Fowler, of Brooklyn, New York—to advocate complete removal of the upper extremity in cases of malignant disease of the humerus wherever located, namely, the necessity for obtaining flaps from tissues as far removed from the site of the original disease as possible. The persistency and virulency of the infection, and its invasion of the parts necessary to form the flaps for a shoulder-joint amputation, would seem to constitute the positive indication for an interscapulo-thoracic amputation, even though this demanded the removal of the scapula and all, or a portion, of the clavicle, with these still remaining uninfected. The attempt to compromise between the latter and an atypical amputation above the shoulder-joint by sawing off portions of the clavicle and scapula in

order to permit of the removal of the soft parts beyond appreciably infected tissues, while this is commendable from the æsthetic stand-point, proved in this case to be far from a conservative measure, since it only invited infection of the highly susceptible cancellated structure of the bones themselves. Further, the inadequacy of the drainage in the shoulder-joint amputation, as compared to that obtained in complete removal of the upper extremity, should not be lost sight of.

The hopelessness of certain cases of *morbus coxarius* with extensive disease of the femur and infection of the soft parts when operative procedures short of amputation of the hip-joint are instituted, and the fact that a certain proportion of these fail of cure because of coincident or subsequent disease of the *os innominatum*, seems to still further emphasize the importance, in the case of the upper extremity, of effecting a radical removal of parts already infected, and those likely to be affected, through interscapulo-thoracic amputation.

The necessity for interscapulo-thoracic amputation for conditions involving extensive involvement of the soft parts alone in infectious processes is illustrated in the following case.

A man, fifty-five years old, a stableman by occupation, was admitted to the Methodist Episcopal Hospital on November 17, 1895, with a history of having, while intoxicated and alone, upset a stable-lantern and severely burned the left arm and region of the shoulder. The parts about the latter were deeply charred, the muscular structures being invaded. Operation was positively declined, although repeatedly offered; and it was not until three weeks after admission that consent was obtained. In the meanwhile the patient's condition had become most unpromising by reason of extensive local and general sepsis. Interscapulo-thoracic amputation was performed as a forlorn hope, after Berger's method (preliminary ligation of the subclavian artery), on December 7. The operation was quickly performed, the loss of blood inconsiderable, and the patient left the table in fairly good condition. Unfortunately, however, pneumonitis, the foundation of which had been laid by the pre-existing septic conditions, de-

veloped upon the side opposite to that of the operation, from which he died on the third day. The operation wound remained uninfected.¹

There is no doubt in my mind that this patient would have had an excellent chance for recovery had the amputation been performed earlier in the case. The extremely septic conditions which he developed in the interval robbed the operation of its character of successful conservatism and placed it in the category of desperate resources.

The following cases of interscapulo-thoracic amputation for osteomyelitis and analogous conditions are recorded in the literature:

CASE I.—William Fergusson, of Edinburgh,² reports the case of a male, aged thirty-three, with "caries" of the humerus and scapula, in whom disarticulation of the humerus had been performed three years before. Complete and permanent recovery followed consecutive interscapulo-thoracic amputation.

CASE II.—Berenger Férend, Lorient,³ report the case of a male, aged twenty-four, with osteomyelitis, and caries of the scapula and humerus, in whom a consecutive interscapulo-thoracic amputation was followed by recovery.

CASE III.—Poncet, Paris.⁴ Consecutive interscapulo-thoracic amputation in a female, aged twenty-six, in whom, two years previously, a resection of the head of the left humerus had been done for "caries," and one year thereafter an amputation at the shoulder-joint became necessary. The conditions persisted, and the scapula became invaded before the final removal of the entire upper extremity.

CASE IV.—S. C. G., male, aged thirty-one. Tuberculosis of shoulder. The history of this case prior to the interscapulo-thoracic amputation included repeated incision and curettage of existing sinuses and abscesses and iodoform treatment at intervals, excision of the shoulder-joint five months, and, finally, after

¹ This case was more fully reported in the *ANNALS OF SURGERY*, February, 1900, p. 211.

² *Medico-Chirurgical Transactions*, 1848, Vol. xxi, p. 309.

³ *Bulletin de Thérapeutique*, 1885, 55. Année, xi, pp. 490-552.

⁴ *Revue de Chirurgie*, Paris, 1887, Vol. i, p. 996.

a further period of eight months, the removal of the entire upper extremity. The axillary artery was ligated preliminarily. The hæmorrhage was severe and necessitated an intravenous saline infusion. The patient made an excellently good recovery from the operation, but a sinus still persisted eight months after the operation.¹

CASE V.—Bishop, New York. Male, aged fifty-two. Tuberculosis of shoulder region. Numerous sinuses existed which had been thoroughly curetted upon two occasions. Finally, interscapulo-thoracic amputation was resorted to, from which operation recovery took place. A large granulating surface still existed when the case was reported.²

The mortality of interscapulo-thoracic amputation for disease, according to the latest study of recorded cases, is 11 per cent.,³ while that of disarticulation of the shoulder under the same circumstances is but 1 per cent. lower. This slight difference may be profitably disregarded in cases in which any doubt exists as to the possibility of removing all infected tissues, since, in a case of consecutive amputation, the risks run by the patient amount to almost double the mortality of an interscapulo-thoracic amputation primarily performed.

Berger and Adelman have each described a prothetic apparatus for use following interscapulo-thoracic amputation, which, it is claimed, is as useful as that for cases in which disarticulation of the shoulder has been performed. The slight actual use to be derived from any of these, however, leaves but little for the surgeon to base a choice upon from this standpoint, while purely æsthetic consideration can be met by the skill of the mechanician.

¹ The Physician and Surgeon, Detroit, 1897, Vol. xix, p. 264.

² The Hahnemannian Monthly, Philadelphia, 1897, Vol. xxxii.

³ Russell S. Fowler. Meeting of Brooklyn Surgical Society, June 2, 1899, ANNALS OF SURGERY, January, 1900.

THYROID MEDICATION IN THE TREATMENT OF DELAYED UNION OF FRACTURES.¹

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SINCE the discovery of the remarkable and sometimes fatal effects of the removal of the thyroid body, much attention has been devoted to the study of the organ, and to-day we possess many interesting and practical facts concerning the important influence which the thyroid exerts on the connective tissue of the body. It is now well established that the removal, atrophy, or parenchymatous degeneration of the gland is the cause of cretinism, myxœdema, and cachexia strumipriva. Concerning the influence which the loss of function of the gland exerts on the normal development and growth of bone we are well informed. Langhans made post-mortem examinations of five cases of cretinism, all of which exhibited delay in the ossification of the epiphyseal cartilages, and in some cases in a very marked degree. He found that the bones grew very slowly in length, ossification was very slow, in the epiphyses the bony centres appeared very late, and, finally, that the epiphyseal disks are maintained far beyond the normal time, some being found as late as the forty-fifth year. A marked delay or absence of ossification in the synchondroses was also observed. In young animals, Hoimeister and Eiselberg have demonstrated that after an early thyroidectomy the development and growth of bone are affected in

¹ Read at the meeting of the New York Surgical Society, January 24, 1900.

a similar manner. In cases of human cachexia strumipriva, Kocher and Reverdin have given interesting and convincing facts. The changes, therefore, in the growing skeleton due to the loss of function of the thyroid gland may be summed up as an arrest, in a high degree, of the growth of the bones in length; a material delay in the ossification of the epiphyseal cartilages and synchondroses, and, finally (according to Langhans), the presence for an abnormal length of time of a bony plate at the site of the former epiphyseal cartilage. In considering these results, one might expect that the loss of function of the thyroid would interfere with callus formation; and Steinlin has made some interesting experiments on animals to determine the influence of the thyroid on the healing of fractures. He selected young rabbits, taking two or three of the same litter; the thyroid was removed from the largest and best developed animal, and the other one or two respectively were used as control animals. As soon as the symptoms of cachexia were evident in the test animal, Steinlin fractured the inner and outer metatarsal bones of the hind feet (in some the last three ribs) of both test and control animals. These bones were chosen as they were easy to break, and did not interfere with the freedom of movement of the animal; and, besides, the inner metatarsal bones and the front ribs acting like a splint prevented too great displacement of the fractured ends. By this method a large number of fractures could be made in a single animal, and the bones thus chosen healed rapidly and are easy of microscopic examination. After a period of several weeks or months the test and control animals were killed, careful post-mortem examinations were made, and the fractured ends removed for microscopic examination. In all the test animals there was an interference of growth in general and a corresponding arrest in the development of the skeleton. The normal healing of the fractures was interfered with, in that there was not only delay in the development and absorption of the callus, but in the formation of permanent bone. During the first two weeks there was no apparent difference in both animals, but after

the third week the formation and ossification of callus were much more rapid in the control animal. At the time when bony callus was present in the control animal, calcification of the cartilaginous mass had not begun in the other, and mobility still existed at the point of fracture. In the normal animal the new medullary cavity had been formed for some time before there was inclination to formation in the trial animal, and in the latter it was not until the twenty-fourth week that the medullary cavity was formed. In all the test animals the bones finally united, there was no abolition of the healing process, and the difference was merely temporary. Steinlin's experiments were limited to a comparatively small number of young animals, and further experiments should be made, particularly on full grown animals, before we can estimate the influence which loss of the thyroid exerts on the healing of fractures. As to the effect of the thyroid on the growth of bone, a most interesting side of the question is seen in the beneficial action which thyroid medication exercises in cretinism and infantile myxœdema. Bourneville treated myxœdematous children with sheep's thyroid, and under this medication the increase in size was almost double as compared with those of normal growth.

Hertoghe asserts that the retardation of growth due to the absence of the thyroid can be corrected up to the twenty-seventh year; and he reports the case of a man, twenty-seven years of age, who gained under thyroid treatment over one and one-third inches in fourteen months.

The radiograph demonstrated incomplete ossification in the phalanges as well as the possibility of a full recovery of growth. Schmidt reports a case of myxœdema in a sixteen-year-old patient, where by means of the X-ray it was possible to see at the lower end of the femur an epiphyseal line which was clearer than the cartilaginous patella, and did not intercept the rays. Under thyroid treatment, growth was resumed and the epiphyseal line disappeared. The introduction of the X-rays has made it possible to make a continued study of the progress of bony development in infantile myxœdema and

cretinism and to appreciate the action of thyroid medication in hastening ossification.

Garne and Londe, in a nineteen-year-old patient with all the signs of myxedema, applied the X-rays to study particularly the process of ossification, and it was found that the epiphyseal centres of the bones were like those of a child two and a half years of age. In the hand only three carpal bones were found developed. The epiphyseal centres of the metacarpal bones were scarcely visible and entirely absent in the phalanges, excepting the third phalanx of the middle and ring fingers. The patient was treated with thyroid gland in substance and consumed sixty-one glands in four months, and at the end of this time considerable progress of ossification was found. Two more carpal bones made their appearance in the skiagraph, and the metacarpals and phalanges all had developed from epiphyseal centres. As a result of these discoveries concerning the influence of the thyroid on the development of bone and the beneficial results following thyroid medication, it was proposed by Hanau, in 1896, that thyroid treatment should be used to bring about consolidation in cases of delayed union of fractures. In 1897 Gauthier reported two successful cases.

The first case was a girl fifteen years of age, who on December 29, 1896, sustained a simple fracture of the lower third of the left femur. Plaster splint applied, and when removed a month later the fragments were in good position, but there was non-union. The same condition continued up to April 15,—*i.e.*, 110 days from time of fracture—when thyroid treatment was begun. Six to ten teaspoonfuls of a glycerin extract of fresh thyroid were given daily,—each teaspoonful corresponding to a gramme of thyroid substance,—and in fourteen days signs of consolidation were evident, and on May 20 the union was complete. The patient's thyroids could be felt.

The second case was a man, forty-eight years old, who sustained on January 10, 1897, a simple fracture of the upper third of the radius. After three months no union, crepitus still present; and on April 20 thyroid treatment begun and continued to May 15 (110 grammes of thyroid gland taken in all), when

union was complete and the arm as strong as the other one. In this case the thyroid could be felt.

Quenu reports a case of compound T-shaped fracture of lower end of femur in a girl twenty-four years of age. Suppuration followed and lasted four months, when a small piece of dead bone was discharged; healing of wound rapidly ensued. At this time entire absence of bony union was present. Capsules of thyroidin were given, and in five days union had advanced to such a degree that a silicate splint was applied and the patient commenced walking with the aid of a cane; complete recovery followed. Reclus reported a case of pseudarthrosis of the femur where there was no apparent reason for delayed union. Before resorting to operation, he tried capsules of thyroidin, and in a very short time callus formed and consolidation was complete.

In another case, the result was absolutely negative; and Reclus adds that in the presence of these contradictory cases he is unable to draw any clear conclusions as to the efficiency of thyroid treatment; but he was able to report that in a case of exuberant callus thyroidin was used with excellent results. Folet reports a case of simple fracture of tibia treated in bed with splints; no union at the end of a month. Ambulatory treatment then instituted; no signs of union at end of two weeks. Thyroidin pastilles (each representing twenty centigrammes of fresh thyroid) ordered, one *t. i. d.* In ten weeks bony union was almost complete. Tronchet reports two successful cases.

The first was comminuted simple fracture of left tibia just above the ankle-joint, in a man fifty years old. Treatment was immobilization at first, then massage combined with immobilization. On the eighty-first day after fracture non-union still persisted; thyroidin tablets were then given daily, and in fifty days union was perfect. Before the thyroid treatment was resorted to, large doses of lime phosphate had been given, and the ends of the fragments rubbed together with apparently no result.

The second case was a fracture of the left tenth rib in a man fifty-six years old. On the thirty-fifth day, crepitus still present, no bony union; thyroidin tablets were given daily, and in ten days union was apparently complete.

Guinard reported a case of pseudarthrosis following fracture of tibia. He made a resection and put the limb in a plaster splint, which was removed at the end of forty days, and non-union was still present. Thyroidin was then given, but the result was a complete failure. Poirier also reports an unsuccessful result after thyroid medication in a case of delayed union of the femur. But in a case of fracture of the tibia, where at the end of three months the fragments had failed to unite, he applied a plaster splint and gave thyroidin; bony union was complete at the end of fifty days.

Rochard reports a case of pseudarthrosis of both bones of the forearm: suture of the ends of the fragments was unsuccessful, and at the end of three months thyroidin was prescribed; result absolutely negative.

In *La Scalpel*, October, 1899 (quoted by Tronchet), are reports of two successful cases. One a pseudarthrosis of the femur cured in one month; the second a fracture of the humerus with non-union at the end of two months. Both rapidly united following thyroid medication.

Ferria (quoted by Tronchet) reports two successes with thyroid treatment. The first a fracture of radius, where, owing to the deformity of the callus, the forearm remained in a position of pronation. Subperiosteal resection of callus. Three months afterwards mobility still persisted. One month of thyroid treatment was followed by complete union of the fragments. The second was a compound comminuted fracture of lower part of the tibia, where, owing to sepsis, eight centimetres of the bone were resected and replaced by a piece of the humerus. Three months later there was no union; thyroid treatment begun, and in six weeks there was a layer of new bone formed of some thickness. The interposed piece of the humerus was then removed, and some months later bony consolidation was perfect.

Steinlin's article contains two personal communications, one from Stahel, who in a case of pseudarthrosis observed no benefit from thyroid medication; the other from Kuppeler, who obtained a hastening of union in a case of delayed union.

The above cases are the result of a short review of the literature, and to them may be added the following personal observation.

A. P., laborer, twenty-eight years old, admitted to the New York Hospital August 22, 1899. Personal and family history good. Patient a small man, well developed, and in good general condition. On November 28, 1898, he was struck by a locomotive and sustained two simple fractures of the left femur,—one at the juncture of the upper and middle thirds, the other of the lower third of the bone. He was treated in a neighboring hospital, and at the end of two months there was found non-union of the upper fracture with overlapping of the fragments.

In February, 1899, the fragments were exposed, their ends freshened, and plaster splint applied to limb. In April, as non-union with deformity still existed, a resection was made and the ends united by silver-wire suture. No union followed, and in July the patient left the hospital.

When admitted to the New York Hospital, there were to be seen on the outer side of thigh the scars of the former operations; the leg and thigh were shrunk, and about one and one-half inches shortening existed. Mobility at seat of fracture was most marked, and the overlapping of the fragments could easily be felt; the lower fragment was drawn upward and behind the upper one. With the X-ray the deformity was most apparent, and there were no signs of any formation of bony callus.

On August 29, through a long incision on the outer front aspect of the thigh the ends of the fragments were exposed and freed from the fibrous tissue which united them. The ends were then caused to protrude through the wound, and after stripping back the periosteum one-fourth of an inch of bone was removed from each end. The fragments were then brought easily into coaptation, and were united by two stout silver-wire sutures. The periosteum was carefully sutured over the wires. Soft parts sutured, sterilized dressing applied, and limb put in the Buck extension apparatus. Union of soft parts was per primam. Six weeks afterwards (October 10) examinations showed that the fragments were in good position, but there was non-union. Plaster splint applied and an elixir of phosphorus pre-

scribed. On November 15 splint removed, and no change was found as regards union. Plaster splint again applied to limb, and thyroid medication was begun, the patient receiving three times a day a tablet containing two grains of the thyroid extract. On November 29 the dose was increased to three grains, and on December 7 to four grains. Examination on December 15 showed some signs of commencing union in that there was less mobility, absence of crepitude, and some thickening about the ends of the fragments. On January 2 the thickening about the ends of the bone had increased and was firmer, mobility decidedly less. Lateral plaster starts from hip to ankle applied and patient was allowed up on crutches. Thyroid extract increased to forty-five grains daily, but has since been decreased. At present there is some mobility remaining, no crepitus, and less projection of the upper fragment when patient elevates the limb.

With the X-ray, some lateral displacement of the upper fragment can be seen, and apparently is due to the cutting out of one of the silver sutures. Around the ends of the bone there is a considerable deposit of bony callus, and there is some bony union between the ends of the fragments.

The result in this case is as yet not entirely successful, but there has been gradual improvement since the beginning of the thyroid medication, and complete consolidation seems to be merely a matter of time. It was not a promising case to start with, owing to the fact of the complete failure of the previous operations, and a rapid healing was not expected. The non-union following the accident may have been due to the faulty position of the fragments, and the same reason may hold for the failure of union following the first operation. The silver-wire suture which was used in the second operation was too small and broke (as it was found broken at the time of the third operation), and thus allowed an overlapping of the fragments. When I operated, I used very stout silver wire, which has secured a good apposition of the ends of the bone, so that the non-union following this third operation was not due to faulty position of the fragments.

As to the benefit exerted by the thyroid treatment in this

case, it certainly has not been rapid; but I am inclined to give it credit, as it was not until the administration was commenced that there were any signs of progress in the healing of the fracture. The limited research I have made comprises nineteen cases, of which thirteen were reported as successful, five as failures, and my own case can be put down as improved. Although the percentage of successes is more than double that of failures, it is yet too early to form definite conclusions as to the success one may expect from the use of this treatment of delayed union of fractures. Further investigation is necessary, and a large number of cases must be observed before we can know in what class of cases we should resort to this form of treatment. Before deciding to use the thyroid, one should consider the cause of non-union in the individual case, whether it is due to some constitutional condition which may be corrected by appropriate medication, or whether there may be some local cause, which can be removed only by operation. In the absence of such causes, the thyroid treatment is indicated, and should be used in preference to resorting to any of the numerous operations which have been devised to effect union. Bearing in mind the more or less serious symptoms which may follow too large a dose, the treatment should be started with small doses. Tablets or capsules, each containing two grains of the thyroid extract, are sufficient to start with, then gradually increasing the amount every few days, and watching at the same time for any unpleasant symptoms. Overdosing may produce an effect opposite to that which we are striving for, as it has been observed in cases of infantile myxœdema that, in the presence of too large doses, while the bones steadily increase in size, they still remain soft. No unpleasant results were, as a rule, observed in the cases reported above, with the exception of Tronchet's second case, when on the eleventh day of treatment the patient had an attack of aphasia accompanied with diminution of sensibility and motion of the entire right side of the body. As the patient was a pronounced alcoholic, the attack may have been due to this cause and not as a result of the thyroid treatment.

Finally, it should not be forgotten that the heart and kidneys should be carefully examined before resorting to this form of medication, as it is contra-indicated when these organs are diseased. From the results in these cases thus far reported, and from the fact that under medical supervision the thyroid therapy is not dangerous, we are justified in recommending the trial of thyroid treatment before proceeding to operative measures.

[“*May 15.*—The result of thyroid medication in the writer’s case is a failure. The improvement noted in January did not continue, so the patient was admitted to my service at St. Luke’s Hospital at the end of February. He was again placed in bed, a plaster splint applied to leg and thigh, and thyroid again administered. A different sample of thyroid was obtained, and was proved to be stronger than the one used at the New York Hospital. Not more than fifteen grains could be taken daily, acetone accelerating the pulse and respiration. At the end of April the splint was removed and non-union still was present. Under the X-ray there could be seen some overlapping of the fragments, and it was noted that the callus, which was present in January, has since entirely disappeared.”—F. W. M.]

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SPLENECTOMY FOR CONGESTIVE HYPERTROPHY.¹

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IN the *Medical News*, 1899, Vol. lxxv, p. 848, I reported the history of two cases of splenectomy, with a general *résumé* of the literature of the subject up to that time. One of those operations was done for a leucocythæmic spleen weighing twelve pounds and seven ounces, and, as a complication, she had clubbing of the cardiac valves. Death occurred from shock just as the tumor was being pulled from the abdominal cavity. It seemed to be that the support to the diaphragm and heart from pressure by the large spleen had been gradually increased by the growth of the tumor, and now was necessary to prolong life; as soon as it was removed by taking away the tumor collapse immediately occurred. I now believe removal of the enlarged organ under such conditions, even though the heart be normal, is absolutely unjustifiable.

The other case was one of enlarged, movable spleen associated with tubercular peritonitis and splenitis, the organ weighing twenty-eight ounces, about four times its normal weight. In this instance the tumor was successfully removed, and the patient was alive several months later, though she was thought to be suffering from pulmonary tuberculosis. At the time the paper mentioned was prepared, I had another enlarged spleen

¹ Read by invitation at the Annual Meeting of The Medical Association of Georgia at Atlanta, April 18, 19, and 20, 1900.

to deal with and under peculiar circumstances. She was therefore kept under observation nearly three months before operation. She was in the hospital during the two months just preceding operation, and opportunities for carefully studying her condition were afforded and accepted. In this case careful and frequent blood counts were made as well as a complete record of her pulse and temperature, and many other details preceding operation. The changes in her condition subsequent to operation were given in detail, and show how little harm results from extirpation of even such a large spleen as was this one, and, *au contraire*, the signal benefit to be derived from its removal,—an improvement that was not possible of attainment in any other manner. Considerable emphasis is placed upon the importance of observation of splenectomy cases, other than emergency operations, for a considerable amount of time previous to operation in order to be certain of the blood conditions, and to attempt to at least arrive at a conclusion as to the actual cause and character of the splenic condition. This may be materially aided by continuing the study after operation. This is absolutely necessary, as it is well understood that not all cases of enlarged spleen are amenable to extirpation. Nearly as many cases of splenectomy have ended fatally as have ended successfully, and for the very reason that the blood conditions had not been studied before operation, the advantage of which was not realized or understood, and as a result the operation has been many times done in cases in which we know to-day it is absolutely contraindicated.

The principal reason usually for removal of the spleen is its enlargement, and this produces marked distress according to its size, the number and character of adhesions, and the interference with the functions of other organs. The sense of intolerable dragging when the tumor is large often demands removal, provided other conditions permit it. This enlargement is usually due to paludal, tubercular, or idiopathic causes, malignant disease, wandering of the organ, axial rotation, echinococcus and other cysts, chronic congestion, amy-

loid disease and injuries, such as rupture. Perhaps the most frequent cause of enlargement of the organ—leucocythæmia—is the one condition in which the operation of extirpation should almost never be performed. More than 100 cases of splenectomy for leucocythæmia have been reported, and in but three of them was it successful. Such results should be sufficient to put this indication for the operation practically beyond dispute. Some writers, however, believe the operation is justifiable when the relative proportion of red to white blood-cells is not lower than fifty to one. In some cases, perhaps, this proportion may not be markedly dangerous; but we must remember the spleen does reach a tremendous size in leucocythæmia, often weighing from twenty to fifty pounds, and the adhesions may be formidable. In such cases, certainly, the fifty to one rule would be a very dangerous one, were it not that in these very marked cases of enlargement the proportion is usually less than the one mentioned. It shows, however, the necessity of knowing the blood conditions. Nor should the proportion of the red and white blood-cells be all we should attempt to learn in examination of the blood. It is well known that different varieties of the leucocytes have different functions, and that the relative numbers of these species of them vary very markedly in different specimens of blood, whether taken from the same or different patients. This is certainly an element of great importance. Aside from this, it is of the greatest moment to know the hæmoglobin percentage of the blood of a patient suffering from a leucocythæmic spleen. If this be not far below the normal, as shown by the present inaccurate instruments, the prognosis of the surgeon is less grave. A blood count of 4,000,000 red and 6000 to 9000 white blood-cells and a hæmoglobin percentage above 70 per cent. would ordinarily be considered a safe blood condition for splenectomy. But should the red cells be only 2,500,000 and the white ones increased to above 9000, and perhaps the hæmoglobin percentage be below 70, I would conclude splenectomy, under the most favorable conditions otherwise, would be absolutely interdicted, unless death without operation

seemed unavoidable. It will be noticed this blood-cell proportion is far above fifty to one. There has often been noticed a paludal intoxication accompanying enlargement of the spleen in people exposed to this germ that can only be removed when the spleen has been removed. This seemed to be so certain to Jonnesco and Vanverts that they have strongly recommended splenectomy in marked cases of malarial intoxication that did not yield to ordinary treatment. The effect of splenectomy on the conditions of the blood is often markedly emphasized in malarial hypertrophy. In wandering spleen there is great danger of sudden torsion of the pedicle, with very severe dangerous results or adhesions to other organs, causing marked difficulties and grave dangers.

Splenectomy is not an operation to be lightly entered upon with scarcely any knowledge of the conditions demanding it and of those absolutely contraindicating it. It is fully as important to know when not to do the operation as when to intervene surgically.

As previously mentioned in the enlarged leucocythæmic spleen, the conditions aside from those of the blood must be very good, indeed, to warrant entering on the procedure. If the organ be very large, the result will be less satisfactory, and if the adhesions be severe the result is still more greatly jeopardized. Vanverts found in thirty-nine cases of enlargement with marked adhesions twenty-eight died, while in thirty-five without adhesions only two died. Profound cachexia is a very dangerous complication. Extreme enlargement of the tumor, especially if it be solid, is a signal disadvantage to the operation and to the patient, as it prevents easy manipulation of the pedicle in operation and tends to greatly add to the shock by the traction and extra manipulation during its removal. Of course, the general health of the patient will influence the result. If the patient be one that has always been unhealthy, the result will not be so good.

•The history of my third case is as follows:

S. G., white, thirty-nine years of age, married, multipara, entered Columbia Hospital October 24, 1899. All her labors were normal; her youngest child is five years of age, and she has had no abortions. Her menses ceased in 1897. Her children had chills and fever at irregular intervals during the summer of 1894, and she, while having no chills, was ill with malaria at the same time and lived in that portion of the city near the eastern branch of the Potomac River. She first noticed a tumor in the left side of the abdomen in 1897, and since then has been unable to perform her usual household duties. Just before entering the hospital, a small ulcer appeared on the inner side of the anterior surface of the left leg. This increased in size shortly after admission, and two small ones soon appeared near it. She was pale but in moderate flesh. She was immediately put in bed, as the pulse was 116 and her temperature above normal. A large mass was found in the abdomen extending from the diaphragm on the left side to the pelvic cavity, where it was easily felt by vaginal digital examinations. Two notches were found in the anterior margin of the mass and an enlarged spleen was diagnosed. During the first week in the hospital the pulse was high and the temperature ranged from 100° to 101° F. A blood examination, made on the 27th, showed red blood-cells, 4,600,000, and hæmoglobin 90 per cent. Under active general and local treatment the ulcers were not healed until about December 18, on which day she was allowed to sit out of bed. In a few hours the healed surfaces became black and showed a tendency to slough. The left foot and right leg took on a marked petechial appearance which covered the rest of the body in a milder form. She was put in bed again. During her eight weeks in bed her general condition had not improved and the spleen had apparently enlarged. It was believed her condition, though unsatisfactory, could not be improved for operation. Blood examination, December 14, 1899, showed no malarial parasites; red blood-cells, 3,500,000, and varied greatly in size. One or two megalocytes and an occasional myelocyte; leucocytes approximately normal in number, the mononuclears being slightly increased. Several times examinations for malarial parasites were made with negative results. From the 12th to the 24th of November the temperature was again nearly the same as during her first week in the hospital, and the pulse ranged from 84 to 104. After that time

the chart shows normal pulse and temperature. Operation was done December 21, 1899. The left kidney was found to be about twice its normal size, quite movable, and to the inner side of the hilum of the spleen. It was not disturbed. A number of urinalyses had shown no abnormality. The spleen, extending from the diaphragm to the pelvic cavity and resting on the uterus, had five notches in its anterior border. Four large arteries and a number of smaller ones were encountered in ligating the pedicle. Two of them, close together, were each about the size of the femoral, and two others, an inch apart, were but slightly smaller. Each was ligated separately with strong silk, fearing to trust catgut for this work. The arteries were each first clamped in two places near the spleen and divided with scissors between these clamps. Ligatures were then placed on the proximal side of them, and, lastly, the veins were similarly treated. Slight hæmorrhage occurred from a large blood-vessel stump on the spleen side, but, as all the arteries had been previously secured, no harm resulted. It amounted only to a partial drainage of the spleen. Owing to the size and position of the enlarged organ, it was found impossible to first ligate and divide the gastrosplenic ligament as had been planned. To a considerable part of the splenic surface were adhered intestine, omentum, diaphragm, and parietal peritoneum. Two quarts of normal salt solution had been thrown under the breasts at the beginning of the operation, and the same amount was left in the peritoneal cavity as the pulse had now risen to 136. That evening her pulse was 114 and her temperature 97.4° F.; her temperature remained at about 99° until the evening of the 25th, when it went up to 101°, the highest point noted previously to the 18th of January, the last day it was registered. This rise lasted but three days. On this date the blood count showed red blood-cells, 4,192,000 and 8000 white blood-cells. January 4, 1900, a blood examination was made by Dr. Carroll, who found no malarial parasites and nothing of moment. January 12 she was allowed to sit out of bed, and was discharged from the hospital thirteen days later. The leg ulcers had nearly healed and her appearance was much better. During the first three days' post-operation she slept but little, and then seemed drowsy, sleeping most of the time and requiring to be awakened for nourishment. On the 29th she became restless and slightly delirious. From this time

to January 7th, she frequently cried from no apparent cause, accused herself of having at some former time committed some unpardonable sin, and refused to be comforted. This condition became better, and believing her being in a room alone had a deleterious effect, she was put in the ward with other patients, and was almost immediately free from her vagaries.

On January 23 her weight was 115 pounds, and on February 5 she visited the hospital, and was again weighed and found to have gained twelve pounds. She had markedly improved in appearance, and was bright, cheerful, and energetic in her actions. Her cheeks were rounded out and rosy. Her leg ulcers were healed. On February 8 Dr. Carroll found her hæmoglobin percentage was 74 and other blood conditions normal.

REPORT OF DR. JAMES CARROLL, HOSPITAL PATHOLOGIST.

Macroscopic.—The organ presents the normal tongue shape, with a flattened slightly concave inner surface, a distinctly convex outer surface and somewhat tapering margins. It measures eleven and one-quarter inches at the smaller end, and a corresponding thickness of two and three-quarter inches and one and three-quarter inches at the ends respectively. The upper margin is convex and smooth, with the exception of a large fissure near the head. The lower margin is concave and deeply notched. The margins are everywhere thick and rounded. The color is dark red, apparently from congestion, and the consistency is rather softer than normal. The capsule is tense and smooth, and stippled with indistinct grayish points which represent the enlarged follicles beneath. The weight of the organ in the fresh state is four pounds and four ounces.

Microscopic.—The section reveals only a chronic passive congestion with hypertrophy of the pulp and follicles. There is no deposit of pigment and the trabeculae are not involved. Some of the veins contain large numbers of leucocytes, but in others the number appears to be about normal. The conditions found may be briefly described as a congestive hypertrophy.

No argument is needed to prove the advisability of splenectomy in a case such as this.

The operation has now a mortality rate of about 13 per cent., and this would be too high were all severe cases of leucocythæmia and malignant disease excluded. Severe adhesions

and marked hypertrophy of the organ are necessarily potent factors in making a mortality rate for splenectomy. Hæmorrhage and shock are the principal immediate causes of death. The blood-vessels of the enlarged spleen are often found to be tremendously large, and necessarily the blood loss is excessive in a very short time from even one of them should it be permitted at all. It is therefore strongly advisable to proceed with the utmost caution in severing and securing these vessels. If forceps are applied before ligation, as was done in this case, the operator should know they are reliable and that they will not unclamp or slip off. Then, too, the vessels should be ligated singly and well back from the cut ends on the central side, with the ligature always passing through tissue as it passes around the vessel. It should pass through between vessels and never through any of them. This is exceedingly important. For this purpose silk is more reliable than other material because it is most easily knotted without loosening. The arteries should be the first to be secured, as the organ is easily distended, and more blood is taken from the circulation if they are allowed to continue pumping blood into the spleen after the veins are tied or clamped. The gastrosplenic ligament should be first clamped and separated, as it permits the spleen to be lifted up and affords better access to the pedicle. If the hypertrophy is marked, this preliminary measure will be oftentimes impossible. Under such conditions, the first vessels coming to view will have to be the first to be secured and followed by the next coming into view, and this plan continued until all have been secured and separated. Removal of the tumor facilitates application of the ligatures.

Shock is produced by separation of many or dense adhesions, by manipulation of the organ during the process of removal, and by removal from the under side of the diaphragm the pressure to which the lungs and heart, as well the abdominal viscera, has become accustomed. If the tumor be large, this is of great moment. This may be overcome by leaving a large amount of normal salt solution in the abdominal cavity when the abdomen is closed or by throwing it into the colon.

In every case in which it is possible, operation should be

preceded by a careful study of the history of the case and careful blood analyses made. In my former paper, already mentioned, I took occasion to suggest the changes subsequent to operation, varied according to the relative normal condition of the organ removed. It is well known these storms of fever, high pulse-rate, and other manifestations of marked trophic and psychologic disturbances are often furious in the adult, and in the child or young animal practically absent. In the case of the much altered spleen, such changes in the vicarious functionating economy have begun long before operation, and thus leaves less to be done in that direction after splenectomy. It is probably from that reason that extirpation is not followed by the critical conditions incident to the sudden taxing of the compensating organs following removal of the normal spleen for rupture, torsion of the pedicle, and other conditions.

Splenectomy for malignant disease has not yet been satisfactory. This is due to the disease spreading from the spleen very early, and therefore rapidly appearing in other structures only to cause an early death. For echinococcus and other cysts the operation is very successful, as it has been for rupture of the organ. During the past two years twenty cases have been operated for rupture, and but two of them died. One of these fatal ones was severely mangled, and had a rupture of the liver as well as of the spleen.

Splenopexy has been recommended and practised abroad for movable or wandering spleen when the organ was less than three times its normal size. The principle of the operation was to form an extraperitoneal pocket by slitting the peritoneum, placing the spleen behind it after separating it sufficiently, and then suturing the flaps over it. It need not be of necessity in the normal region of the spleen. I have had no experience whatever with this operation, and for that reason am not in a position to approve or condemn it. However, my impressions are that it is an unwise procedure. There is danger of sloughing of the flaps after the separation, and of marked dragging and consequent injury from such suspension of a mass of tissue weighing even twenty-one ounces.

OPERATION FOR CURE OF LARGE INCARCERATED HERNIA OF LONG STANDING.

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As several articles have recently appeared in the *ANNALS OF SURGERY* against the advisability of operating in large incarcerated hernias of long standing, I wish to report a case which first came to my notice about one year ago, when I secured the following history.

Woman, married, aged fifty-four. Said that twenty years ago, during the labor of her first confinement, she felt in the region of the umbilicus a violent pain, and noticed thereafter the appearance of a swelling about the size of a walnut. This swelling gradually increased, more rapidly during the last five years, during which period it increased in size one-half. Occasional attacks of localized peritonitis occurred, which at first were mild and infrequent; but as the tumor grew in size these attacks became more frequent and far more severe in character.

On examination, I found a tumor extending from the umbilicus to the knees, measuring twenty-six inches; with patient seated on an ordinary chair it came within six inches of touching the floor. The tumor was distended, soft, and elastic; on percussion in some places it was dull, in others tympanitic; the skin was thin, stretched, glossy, and marked by numerous dilated veins, pressure being quite painful. This tumor was evidently an umbilical hernia, and at first I advised against an operation because of the enormous size of the tumor, the contents of which, I believed, were most of the large and small intestines, with the mesentery and omentum. As the sac of the tumor was made up at the expense of the abdominal wall, I did not see how it

would be possible to secure enough skin and peritoneum to cover the viscera if they could be replaced.

About the first of last November I was hastily summoned to see her. On my arrival, upon examination I found several large ulcers in the wall of the sac, from which a considerable amount of fluid had made its escape. After repeated examination, I finally advised that an operation should be essayed.

She was removed to the hospital, and in a few days I proceeded with the operation. Upon incising the anterior surface of the sac, it was found to contain part of the ascending, the transverse, and part of the descending colon, all of the small intestine with the exception of a small part of the duodenum and ileum, with the mesentery and omentum. The bowels, both large and small, with the omentum, were firmly adhered, the result of the frequent attacks of peritonitis. Many of the adhesions were so firm and well organized that it was necessary to carefully dissect them loose or ligate before separating them from the hernial sac.

The abdominal ring through which the viscera made their exit from the abdomen was about fourteen inches in circumference, and upon placing my hand within the abdomen it seemed that it might be impossible to replace the viscera within its cavity. While there seemed to be enough skin, yet so much of the peritoneum had been taken to form the sac that but little space was left, and not until the last coil of intestine was detached, was I certain that the space was sufficiently large to retain them. The last coil of intestine to be detached was the colon, which was firmly grown to the under side of the ring for a space of four inches.

So firmly were the intestines packed within the abdomen that I considered it a matter of grave importance as to whether I should close the ring or not, since this could not be done without increasing the pressure, from which I would expect to meet serious symptoms; and, on the other hand, should I not close it, I feared a return of the hernia. I decided finally to use a part of the sac for a covering to close the ring, and finished the operation by approximating the edges of the skin.

It required two hours to perform the operation, and naturally there was some shock. After the patient was placed in bed her pulse registered 120 beats to the minute, though in the

evening it dropped to 96, only to increase again the following morning to 108, from which time there was a gradual increase until the ending of the third day, when it was 133. It then declined again, and during the next four days it ranged between 112 and 120.

The temperature on the first day ranged from 98° to 98.5° F., after which it registered from 99.5° to 100.2°. The highest point was reached on the morning of the ninth day, after which it gradually receded to normal, though the pulse continued above 100 for two weeks.

The most serious symptom was that of vomiting, the rejected matter being of a dark brown color. This was so persistent that we were unable to take her temperature by mouth during the first week. Everything in the way of nourishment was vomited for the first four days, and only through repeated efforts were we able to have her retain cathartics enough to be effective. We did not succeed in moving her bowels until the fourth day. Some of these symptoms may have been of septic origin, since, as stated before, it was a pus case to start with. Also, owing to the large size of the tumor, it was impossible to thoroughly asepticize it; further than this, a coil of bowel was adhered to the sac just over the point of perforation, and at this place the bowel was diseased. With these conditions one would naturally be on the alert for danger signals.

I attributed, however, the persistent vomiting, as well as some of the other conditions, to pressure of the viscera against the stomach. After abdominal operations a common complaint is of gas in that region, and, since there was no room for distention in any other direction, there would necessarily be considerable force exerted in that direction, causing vomiting and a rapid pulse.

The patient returned to her home in less than four weeks, and her recovery is complete.

RADICAL TREATMENT FOR CURVATURE OF THE PENIS.¹

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By curvature of the penis is commonly meant a bending downward of the organ when in a state of erection, and such is the significance of the term in this connection. Anything which robs the corpus spongiosum of its natural elasticity, so that it fails to lengthen, as do the corpora cavernosa during erection, will cause curvature, and the amount of the curvature will correspond to the loss in the elasticity. Acute inflammations involving the periurethral tissues temporarily produce this deformity, and any inflammation or traumatism which leaves a permanent cicatrix in the corpus spongiosum will serve to render it lasting. The danger of causing chronic curvature is a chief objection to internal urethrotomy. Most curvatures are not sufficient to act as a bar to sexual intercourse, and, as many of them slowly tend to improve or to become tolerable, nothing in the way of radical treatment is usually demanded or advisable. In the case I have to report, however, the curvature was so extreme as to act as a complete bar to the accomplishment of sexual intercourse, and, as the subject was a young man of twenty and an only son, it was most natural for his parents to urge that something radical should be done. The history of the case is as follows:

¹ Read at the May, 1900, meeting of the American Association of Genito-Urinary Surgeons, held at Washington, D. C.

When twelve years of age he contracted gonorrhœa from his nurse. The inflammation ran a very severe course. Two years later, stricture of the anterior urethra having formed, internal urethrotomy was performed by a prominent specialist. Much inflammation followed the operation, together with the permanent development of the marked degree of curvature just mentioned. On examination, the entire anterior urethra, when felt from the outside, appeared as a hard, unyielding mass.

In order to test the degree of curvature, the patient was made to induce an erection. The thickened urethra then stood out prominently, much like the cord to a bow. In its middle penile portion, however, there was an especially thick node, which I took to mark the site of the chief stricture and the spot where the deepest cutting had been done in connection with the previous internal urethrotomy. It also appeared as if some of the shortening were due to an arrest in the development of the urethra and the corpus spongiosum, caused, perhaps, by the effects of inflammation and urethrotomy on a young growing subject.

The parents were much discouraged. They had taken their son to the gentleman who had performed the internal urethrotomy and to a number of other special workers, but none of them had offered any suggestions. In fact, as far as I am aware, no one had ever heretofore attempted to radically correct such a deformity. At last, yielding to the solicitations of the parents, I promised to make the attempt, provided they agreed to hold me blameless in case of failure not only to cure the defect, but also should the operation leave the patient in a condition more unsatisfactory than before.

The operative idea which entered my mind was to cut through the urethra and the surrounding unyielding tissues, and then to cause a separation of the ends sufficiently to make up for the urethral shortening, the space between the ends being left to fill in by granulation, as in extensive urethral resections. I was afraid to resect the penile urethra anterior to the scrotum lest a fistula should persist. The perineum was accordingly laid open from just above the rectum up onto the uplifted scrotum. The urethra was then cut across very obliquely in the bulbous region. The penile end, in order to facilitate its retraction, was dissected free from the surrounding tissues for about three-quarters of an inch, after which the penis was pulled up and bent back over the

pubes. In that position of the penis a maximum amount of separation of the cut urethral ends occurred. Then, while maintaining the penis in that position, the penile end of the urethral roof was carefully stitched with fine catgut to its surrounding tissues, while a longitudinal half-inch cut was made along its floor. The urethral roof of the posterior end required no such stitching, as it had not been dissected free from its surrounding tissues. This done, a perineal vesical drainage-tube was inserted, after which my usual urethral tube was adjusted and the perineal incision carefully closed by suture. The penis was left bent back over the pubes and secured in that position by transverse strips of plaster. The wound healed well, and the operation was a distinct success.

The young man, now nearly two years afterwards, has a good free stream on urination and a penis which is nearly straight during erection. The sexual act can be accomplished without any difficulty, and his bar to matrimony is consequently removed.

REPORT OF A CASE OF EXSTROPHY OF THE
BLADDER, WITH REMARKS UPON THE
OPERATIVE TREATMENT OF THAT
CONDITION.

By BRANSFORD LEWIS, M.D.,

OF ST. LOUIS,

PROFESSOR OF GENITO-URINARY SURGERY IN THE MARION SIMS COLLEGE OF
MEDICINE.

THE subject of this report is a man, aged twenty-seven, German, clerk. He has one brother and one sister, both of normal development. There is no other instance of genital abnormality in his family excepting in a female cousin, who is the subject, also, of complete exstrophy of the bladder. Singularly enough, these two, learning of each other's anatomical plight, and, no doubt, appreciating their inability to satisfactorily consort with normally-built individuals, agreed to marry, and are now living with one another as husband and wife. Needless to say, sexual functionation is an unhopèd-for blessing in that family. The patient says that he sometimes has sexual desire, but is unable to gratify it in any satisfactory manner. He even has nightly emissions of an abortive kind, at times.

Examination reveals a reddish, globular mass, two inches in diameter, protruding from the pubic region, three-quarters of an inch above the general skin surface; it is covered with mucous membrane that is constantly moist and soggy, that is darker in hue than the normal bladder lining, and shows the effects of the irritation to which its abnormal position and surroundings subject it. Below this mass is the stump of a hardly-recognizable penis, that is broader than it is long, grooved along its dorsal aspect by a mucous-membrane-lined channel that is

evidently intended for the urethral floor, but under existing conditions cannot perform the office pertaining to that organ.

Between the penis and the projecting bladder-mass, palpation shows the symphysis pubis to be entirely lacking; there is a distance of at least two and three-quarter inches between the pubic rami. Instead of the natural pubic symphysis, covered with integument, the urethral groove extends uncovered directly up to the exposed bladder membrane. On each side of the junction of these two, at a distance from one another of three-quarters of an inch, are the two urethral openings, indicated by the periodical dripping of urine from them. There is no sign of an umbilicus.

The testicles are well descended, and occupy their natural position in the scrotum, the left hanging lower than its fellow. Prostate and seminal vesicles appear to be normal to rectal feel, though there is such tenderness of these parts that this cannot be precisely determined.

With the aid of a rubber receptacle, the patient has been able to catch and carry the urine as it emerges from the ureters, and, to a large extent, relieve himself of the contact of urine with the neighboring parts. He says that he does not suffer any actual pain on its account, and is able to undertake any kind of ordinary labor. Nevertheless, the urinous odor is always perceptible and oppressive; and it is clear that such an individual is especially liable to renal infection through the exposed urethral openings.

For the purpose of remedying this condition, great energy and enormous ingenuity have been displayed by surgeons. Simon, Pozzi, Czerny, Maydl, Sonnenburg, Segond, Murray, Harrison, Rutkowski, Fowler, Mundel, Trendelenburg, Wood, LeFort, Thiersch, Rydygier, Pancoast, Lloyd, and a host of others have tried their brains and their hands at discovering a mode of solving the problem. In the main, two classes of operative work have been undertaken,—one, by plastic manipulation, to make an artificial covering for bladder and urethra; the other, to divert the urinary channel either externally in a more suitable direction, or into the lower bowel with the purpose of making that the receptacle for the temporary retention of the urine. Of the first class, plastic work, Maydl's has been

the most favored procedure. It consisted in making flaps of integument from the adjacent belly-covering, turning them over the bladder membrane so as to make the skin surface the future mucous lining of the anterior wall of the artificial bladder. This operation had two advantages and two marked disadvantages: It furnished a covering for the exposed membrane and assisted in the easier disposal of the urine as it constantly flowed from the smaller opening. But it did not secure any additional retentive power to the bladder, did not furnish a sphincter for that organ, and the rubber receptacle was as necessary as ever; and the tegumentary surface in time grew the product natural to it, projecting hair into the artificial bladder, which became incrustated with phosphatic salts, caused decomposition and reawakened the old, sickening urinous odor, as well as numerous forms of irritation. Such patients had to be scraped out regularly to prevent prolonged spasmodic contractions of the rectum, to which the irritation gave rise.

Maydl's later suggestion (*Wiener medicinische Wochenschrift*, 1896, xlvii.) has proved much more efficacious. This consists in exsecting from the bladder-wall its trigone, together with both ureters, and implanting them into the sigmoid flexure of the colon; then cutting out the remainder of the bladder and closing up the resulting abdominal aperture. The urine then drained into the rectum, and there was no exposed tissue in the pubic area. The rectum acquired tolerance for the presence of the urine, as well as an ability to hold it for several hours.

The chief danger connected with this operation has been the tendency of infection to travel from the rectum up the ureters and involve the kidneys. The valvular effect of the obliquely-entering ureters has not always sufficed to prevent this. Nevertheless, some twenty-two cases have been operated upon in this manner, with three deaths, an exceedingly favorable showing for so radical and delicate an operation, and one that has been in use for so short a time.

To make the valvular effect of the ureteral openings more complete, Fowler (*American Journal of Medical Sciences*,

March, 1898) devised a special valve made from a tongue-like projection of rectal mucous membrane, and reported a case successfully operated on in that way, living and healthy two years thereafter.

On the strength of a remarkable experiment successfully executed by Tizzoni and Poggi in 1889, who, after cutting out the bladder of a dog, constructed a new bladder from membrane taken from the intestinal tract and then engrafted the ureters into it, making a working urinary receptacle, there has been on the part of some operators a reversion to the plastic method of remedying bladder exstrophy. Rutkowski argued (*Centralblatt für Chirurgie*, No. 16, 1899) that conservatism in surgery should not countenance the sacrifice of organs, as carried out in Maydl's transplantation of ureters and excision of the bladder; that the bladder should be utilized instead of being excised.

In the belief that the cause of former failure in supplying the anterior bladder-wall depended on the use of inappropriate material, skin instead of mucous membrane, which not only failed to afford contractile power because of lack of muscle-fibres, but became a source of irritation through the hair growing from it, Rutkowski made a flap from the small intestine, leaving attached to its mesentery and bringing it forward as a covering for the bladder; afterwards the abdominal walls were closed over the newly constructed organ. The patient, a boy twelve years of age, recovered, and became able to retain a small quantity of urine for an hour or so.

Ingenious as this procedure is, its result does not compare with those of Maydl above mentioned; and it is evidently of vastly greater difficulty in execution.

Of greater simplicity and markedly less danger is the plan of Mundel (*ANNALS OF SURGERY*, December, 1899), which consists in taking a bladder-wall from some animal, say a sheep, and engrafting it onto the lower fascia of the abdominal parietes, protected from the under side by gold-foil until it has become attached; then the newly-placed flap, with the skin

above it, is swung over the extruded bladder-wall and attached to the opposite edge.

This plan may seem a little fantastic, but its author reports success in carrying it out on a dog.

A procedure that, so far as I know, has not yet been carried out on the human subject, but has been successfully practised by its author, Dr. Jacob Frank, of Chicago (*Medical Record*, October 14, 1899), on several dogs, is that of vesicorectal anastomosis, effected by decalcified bone coupling, after the manner of intestinal anastomosis. The advantages claimed relate especially to the continued separation of the ureteral openings from the rectum, except by indirect connection through the anastomotic opening, which would obviate ascending ureteral infection. Of the fifteen dogs operated on by the author, ten recovered and five died. The dogs that recovered would at first hoist their legs as in their natural endeavor to urinate, and would then squat down and urinate from the rectum. This would be done periodically, the animals seeming to accustom themselves to the new order of things.

The author predicts that vesicorectal anastomosis will soon become the popular mode of procedure in relieving exstrophy; the anastomosis being made first, and the plastic operation later.

Another mode of making this diversion of the urinary stream into the bowel is that but lately executed by Carl Beck, of Chicago, reported in the *Chicago Medical Recorder* for November, 1899. The case was one in which there was tuberculosis of the bladder, for which cystotomy and curettement of the bladder had done no good. Later, after median incision, the ureters were cut off about an inch from the bladder-wall, and the ends picked up. A flap was made in the gut, consisting of peritoneum, subperitoneal and muscular tissue, leaving nothing but the mucosa and submucosa. The flap was turned back and the ureters carried beneath it. A small opening was made in the gut and the ends of the ureters carried through, leaving about one and one-half inches of the end hanging free in the lumen of the bowel. The ureters were placed one above

the other in passing through the bowel; while the flap held them in a sort of groove in the bowel-wall. The peritoneum below was sutured for a short distance.

The innovation introduced in this case, of leaving the ureter ends hanging free in the bowel, seems to have worked admirably. The patient recovered promptly, and five weeks afterwards was able to hold his urine four hours at a time. Another innovation, to which the operator ascribes much of the ability of the bowel to hold urine satisfactorily, was that of inserting the ureters into the sigmoid flexure instead of into the rectum. This, however, is in opposition to the views of Fowler, who made an instructive physiological observation in connection with the case of exstrophy upon which he performed transplantation. He noticed that while urination took place from the rectum at about the normal intervals, defecation likewise occurred at about the normal intervals, that is, once daily; and the movement was formed and not mixed with the urine or dissolved in it, as might be expected. In explanation, Dr. Fowler suggested that the normal accumulation of feces takes place above the sphincter of O'Bierne in the sigmoid flexure, not in the rectum, which is usually empty except at the time just before defecation. Therefore the rectum serves very well as a receptacle for the accumulation of urine, and the sigmoid for the accumulation of the feces. However this may be, the fact is established that the rectum takes on the function of a urinary receptacle with gratifying promptitude and ability.

In a personal communication to me regarding the present condition of his case, referred to above, Dr. Beck says, under date of February 23, 1900, "Referring to your inquiry concerning the patient with implanted ureters, he is perfectly well. He is attending to his work, comes to see me occasionally, about once a week. He urinates about every two hours, clear urine; defecates about twice in twenty-four hours. At night he gets up usually once to urinate; but if he wants to, he is able to hold his urine as long as six hours. I have told him not to do so, in order to avoid irritation of the rectal pouch. He is

gaining in weight, and every indication is present that he is cured, now about six months after the operation."

An impartial review of the results of surgical measures undertaken for the relief of vesical exstrophy, at the present day, can hardly fail to convince one that the nearest solution of the problem lies in the ureteral-transplantation and vesical-extirpation methods. Testimony to this effect is evident in the reports of those who have been most ardently in favor of autoplasmic methods, and have presented operative results successful in the highest degree of their expectations. For instance, we read the report of Küster (*Centralblatt für Chirurgie*, 1889, p. 533) of a case, a boy thirteen years of age, operated upon by Thiersch, by autoplasty. There were seventeen séances or steps to the operation before the cure was completed; and then, after the bladder had been covered and the flaps had grown together as the operator desired, he admits that the phosphatic incrustations on the hairs and irritation to which they led induced abscesses and fistulæ that reacted onto the unsatisfactory urinary condition, establishing a vicious circle from which he was unable to extricate the patient.

Pozzi, in *Annales des maladies des organes genito-urinaires*, 1897, page 18, gives in admirable detail and with instructive drawings the steps by which he was able to completely cover the exposed structures of an exstrophy, and the photograph of the final result four months afterwards makes a good appearance; but at the same time we read in the context, "It is to be remarked that the perfecting of the final operation which closed the meatus and covered the ureters was followed by irritation quite active though temporary. The urine . . . provoked anew the signs of inflammation and pain. They were successfully combated with prolonged baths, vesical lavages with the double-current catheter, light cauterizations with silver nitrate, generous applications of vaseline; and it became necessary at one time to anæsthetize the patient in order to clean out the new vesical cavity, which contained epidermal *débris* mixed with phosphatic deposits." Later this condition seems to have been ameliorated and, as the author says, "Cou-

ditions were very satisfactory. There was a depth of eight centimetres to the bladder cavity, into which could be injected fifteen or twenty cubic centimetres of liquid before it would return; micturition was not painful, and one could note, at times, an interval of twenty minutes between urinations."

At the third session of the Association française d'urologie, October, 1898, there was a discussion by several of the members who had resorted extensively to autoplasmic methods. Pousson claimed the Sonnenburg method (the attachment of the ureter to the base of the penis, in the male; to the lower extremity of the abdomen, in the female; with extirpation of the bladder mucous membrane) to be the best, since it permitted the use of a urinal to good advantage, and placed the formerly exposed bladder membrane out of harm's way by doing away with it altogether. While M. Forgue, who had operated seven times on five children, admitted that a result ideal, even for this operation, was not always obtainable. "A bladder without capacity, a bladder-neck without a sphincter; in these we have the anatomical obstacles against which our attempts at bladder restoration clash. Whatever the operative asepsis, however exact the technique of our suturing, we bury in the depth of the tissues an infected organ, and are exposed, because of that fact, to interference with our lines of union." So that even those who have made most use of it can offer little hope from this means.

On the other hand, how different are the successes attained through the transplantation method. Success with it is not a mockery, not a failure! For instance, aside from the cases already mentioned, coming from German operators, the one operated upon by Dr. Dudley P. Allen, of Cleveland, and reported in the *Journal of the American Medical Association*, July 29, 1899, might be mentioned. The operation was done on a boy, November 3, 1898, and he was discharged from the hospital, well, on December 10, following. Since then he has been in excellent health (up to the time of last report); he has had no irritation of any sort from the retention of the urine

in the large intestine, he retains it without difficulty during the day, and from four to five hours during the night.

The vast difference between such a result as this, as compared with the best that the literature of autoplasty can show, is such as to leave no room for doubt. Pozzi's claim that in his successful case one could, at times, note an interval of twenty minutes between urinations, appears almost pitiful beside it.

Dr. E. Herczel, of Budapest, in the *Centralblatt für die Krankheiten der Harn und Sexual-Organen*, 1899, p. 563, reports the results of three cases of exstrophy upon which he operated after Maydl's transplantation method.

CASE I.—The first, a boy five years old, was operated on in May, 1897. In March, 1898, his condition was reported by the operator as admirable. Quantity of urine 1000 to 1200 cubic centimetres in twenty-four hours; specific gravity 1013; slight amount of albumen, no pus. The boy was able to hold the urine five hours at a time, and then to eject it in a good stream from the rectum. In August, 1899 (a year and a half after the operation), the condition continued as satisfactory. The patient, now a rapidly-growing and strengthening boy, enjoyed living, retaining his urine for six or seven hours during the daytime, but relieving himself oftener at night or running the risk of wetting the bed while in deep sleep.

CASE II. was a twenty-five-year-old man, and was operated upon December 20, 1897; convalesced satisfactorily, and soon acquired the ability to control his new urine receptacle. In June, 1898, he reported that he felt entirely well, held the urine for three hours, and had taken on considerable weight. Another letter, dated May, 1899, stated that he was free of any pain and felt entirely well; but that on experiencing cold he had to urinate oftener than at other times; also that urine escaped into the bed at times in his sleep.

CASE III., eleven-year-old boy; operation on March 9, 1899. Recovery without incident, and, at the time of making the report, a satisfactory condition.

In the June, 1899, number of *Revue Mensuelle des Maladies de l'Enfance*, Nové-Josserand reports a successful case

operated on after Maydl's plan. The operation required one hour and a quarter. In this case the patient was in a perfectly satisfactory condition three months afterwards. Urination occurred not oftener than every three hours, and there was no indication of any involvement of the kidney.

In the author's review of seventeen cases subjected to Maydl's operation, two deaths were recorded as attributable to the operation,—one from shock and the other from infection. The secondary accidents noted were fistulæ of the urinary passages with an accompanying localized peritonitis, all of which cases recovered. Pyelonephritis, as the result of ascending infection, resulted in the death of one case after a period of four months. Urinary continence was perfect in all of the cases excepting two. The patients were able to hold their urine for at least three hours, sometimes for six or seven hours, and in one case throughout the night. The urine was voided sometimes mixed with fæcal matter, sometimes alone. The tolerance of the rectal membrane was perfect.

The results of the transplantation methods for the operative relief of exstrophy, as indicated in the histories of cases so treated in the last five years, make an extremely favorable showing for them.

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 24, 1900.

The President, B. FARQUHAR CURTIS, M.D., in the Chair.

TUMOR OF THE PAROTID.

DR. CHARLES L. GIBSON presented a man, aged forty-three years, who entered St. Luke's Hospital December 18, 1894. There were no factors of interest in his history excepting those bearing on his local condition. A swelling of very small size had appeared just below and in front of his left ear nine years before. It was entirely painless and remained stationary in size until recently. When the patient was first seen by Dr. Gibson, five months prior to the operation, the growth was about the size of an English walnut, soft, but not fluctuating. The tumor was removed December 19, 1894. It proved to be situated in the parotid; it had no well-defined limits, and broke upon manipulation. Its pultaceous contents had for the most part to be scraped away. The facial nerve branches were uninjured. The wound healed uneventfully. Five years have elapsed since the operation, and there have never been any signs of a recurrence. The pathological report, by Dr. J. S. Thacher, was as follows:

"A small mass of rather loose and irregular connective tissue, with some small spots of greater consistence. Microscopic examination: the sections are not satisfactory, and a positive diagnosis cannot be given; but in places there are appearances which leave but little doubt that there is present a new growth of the kind classed as sarcoma of the parotid. . . . There is a good deal of normal gland tissue. But there are also some small areas rich in cells which are arranged in parts as in ordinary sarcoma, and in parts in illy defined elongated alveoli resembling those of a scirrhus cancer, both of which appearances are usual in parotid sarcomata."

Dr. Gibson presented a second case of parotid tumor in the person of a man who was admitted to St. Luke's Hospital August 11, 1899. Previous and family history negative. Eleven years ago he first noticed a lump in the parotid region about as large as the end of his thumb, which very slowly increased in size. Eight years ago it was operated on and the lump excised. Subsequently the region of the scar felt a little hard, and two years ago a recurrence of the tumor in the parotid was appreciated. It was then about the size of the end of his little finger and was slowly growing, in spite of the fact that for a year it had been treated with caustics. It never gave rise to pain.

The patient was operated by Dr. Gibson on August 18, 1899. The tumor involved practically the entire parotid gland, and was about as large as a Bartlett pear. The operation consisted of the total extirpation of the parotid: it was quite bloody, the vessels being apparently enlarged. The two lower trunks of the facial nerve were recognized and isolated, but they eventually had to be sacrificed. The orbital branch was not seen, but was evidently cut. The patient made a good recovery; but the operation was followed by complete facial paralysis, which has, however, not given him as much trouble as is usually the case with this deformity.

The specimen removed was submitted to two pathologists, one of whom regarded it as an endothelioma and the other as a myxosarcoma. The following is the report submitted by Dr. Lewis A. Conner:

"Microscopical examination of the tumor shows it to be of the 'mixed' type so common in parotid growths. Most of the substance of the tumor is made up of medium-sized round and cuboidal cells of the connective-tissue type, which in many places are seen to have a very intimate relation to the walls of the blood-channels.

"Scattered throughout the mass are seen small areas of cartilaginous tissue and many areas which have undergone mucoid degeneration.

"These tumors are at present considered by many to be endotheliomata which have undergone, in some places, degeneration, and in others metaplastic changes."

Dr. Gibson said these two cases presented some interesting features as to the relative malignancy of tumors of the parotid

gland. In the first case, according to the pathological report, the tumor contained sarcomatous elements, while clinically it was very benign, having existed nine years before an operation was undertaken, and since then five years had elapsed without any signs of recurrence. In the second case, the tumor was first noticed eleven years ago; three years later it was excised, and a recurrence had taken place two years ago. One pathologist regarded it as an endothelioma, another as a myxosarcoma, showing that some uncertainty still exists as to the pathological nature of these growths.

The speaker said that, in view of the apparently benign character of some of these tumors, there was some doubt in his mind as to whether so serious an operation as total extirpation of the gland was justifiable, in view of the fact that it results in total facial paralysis. He suggested that a section of the growth be removed for examination before total extirpation is resorted to. These growths should also be operated on at the earliest possible moment, when they might perhaps be eradicated by an operation not necessarily followed by damaging results.

DR. ALEXANDER B. JOHNSON said he had operated on two cases of tumor of the parotid in which the growth presented such a peculiar type of structure that it was difficult to make out whether it was malignant or benign. In one of the cases, the tumor, which was of moderate size, had existed for many years, although pathologically its structure was similar to what we regard as malignant sarcoma. Subsequent to its removal the patient was lost sight of, and the speaker was unable to say whether a recurrence had taken place. In his second case, the growth apparently became quite malignant in character after it had existed for a long time. After its removal this patient was also lost sight of.

DR. WILLIAM B. COLEY said that although, as a rule, tumors of the parotid gland were not very malignant, there were some exceptions to this. The speaker said he had seen quite a number of cases of sarcoma of the parotid, some of which proved fatal in less than a year from the first appearance. In other cases the growth for a long time is benign or very slightly malignant, and then suddenly takes on malignant features and runs a very rapid course.

DR. GEORGE WOOLSEY referred to a case which he had oper-

ated on a number of years ago. The growth was a fibrosarcoma extending deeply into the parotid region. The operation was done for a recurrence, the original tumor having been removed some six months before. About two and one-half years after the second operation, when the patient was last seen, no recurrence had taken place.

DR. CURTIS said it seemed probable that in many of these cases the growth was originally of a mixed type and ran a benign course for some time before undergoing malignant change. Experience goes to show that partial removal of these apparently benign tumors is dangerous, as it stimulates to more active development the malignant elements of the growths.

DEFORMITY AFTER POTT'S FRACTURE RELIEVED BY OPERATION.

DR. ROYAL WHITMAN presented a little girl, who, in May, 1899, fell from a second-story window, a distance of about thirty feet, and fractured her left ankle. She was taken to a hospital and treated there, but the result was not satisfactory. Last October, when Dr. Whitman first saw her, the foot was in a position of marked valgus. She was admitted to the Hospital for Ruptured and Crippled, and operated on six weeks ago. A small wedge of bone was removed from the tibia, the fibula was broken at the site of the former fracture, and the foot placed in its proper position. The result was entirely satisfactory.

Dr. Whitman said that in this and in similar cases he allowed the patients to walk soon after the operation, the foot having been fixed in a plaster bandage. He suggested that the inner border of the shoe be thickened, so that when the foot is stepped upon it is placed in a position of slight supination, thus a tendency to flat-foot might be guarded against.

DR. WILLY MEYER said he could recall quite a number of cases of Pott's fracture occurring in patients between the ages of fifteen and thirty years, and even older, where he had been called upon to operate, a year or eighteen months after receipt of the injury, for traumatic talipes valgus. In treating this deformity, the speaker said, he did not remove a wedge-shaped piece of bone, as Dr. Whitman did, but in every case he resorted to a linear osteotomy through the tibia and fibula at the site of the old fracture. He always found a rather spongy condition of the

bone in that region, and experienced no difficulty in pushing the foot over into the over-corrected position, leaving it there for about twelve days, and then placing it into its proper position. The final result was in every case very good, and the operation was extremely simple. The speaker said he did not apply an Esmarch bandage; he made a longitudinal cut down upon the tibia and also on the fibula, and then used the chisel to go through the bones.

EXTIRPATION OF THE SPLEEN FOR RUPTURE.

DR. PERCY R. BOLTON presented a boy, twelve years old, who was admitted to Hudson Street Hospital on August 21, 1899, with the history of having fallen in front of a horse, and while in a supine position the horse stepped on him in the left hypochondriac region. When he was brought to the hospital, shortly afterwards, his temperature was 99.4° F.; respirations, 46; pulse, 94, full and slow. He was somewhat pale and seemed moderately shocked. There was no fracture of the ribs. The abdomen was somewhat rigid, and there was tenderness in the left flank. The urine contained a large amount of albumen and many blood-cells. There was no vomiting.

The patient slept fairly well upon the night after his admission. The next morning his pulse was 116; rather soft. The abdomen was slightly distended and the tenderness was more general and pronounced. There was dulness over the left flank. The urine still contained a large amount of blood. The patient gradually became more exsanguinated and restlessness became a pronounced symptom. An exploratory operation was thereupon deemed advisable. An incision, three and one-half inches long, was made through the under border of the left rectus; and upon opening the peritoneum a laceration of the spleen was found at about the junction of the lower and middle thirds, dividing the organ into two parts. There was only moderate bleeding going on from the upper of the two portions; none from the lower. The abdomen contained some fluid blood and many clots. The pedicle of the spleen was at once clamped; then the organ was tied off and removed. The peritoneal cavity was then washed out and the abdomen closed over an iodoform gauze drain which led down to the pedicle of the spleen. There was a large hæmatoma about the left kidney which was left undisturbed. At the

close of the operation the patient's pulse was 152; respirations, 48. He reacted under a vigorous stimulation, and from that time on his recovery was uneventful. Ten days later a blood count was made, which showed 2,940,000 red cells and 18,333 white cells per cubic millimetre.

Dr. Bolton said that injuries of the spleen, compared with those of other abdominal viscera, are not very common. Edler's group of 160 cases includes 83 subcutaneous injuries, 51.8 per cent.; 42 bullet-wounds and 35 stab-wounds, 48.2 per cent.

Of the 83 subcutaneous injuries, complicated and uncomplicated, 72 died, 86.7 per cent.; 11 recovered.

Of the 83 subcutaneous injuries, 10 were contusions, and of these 3 recovered, 7 died.

Seventy-three were ruptures, and of these, in 52, the spleen was exclusively injured, or the associated injury was decidedly subordinate.

Of these 52 cases, in 28 the spleen was normal, 2 recovered, and 26 died; while in 24 the spleen was pathological and 6 recovered. Total, 8 recoveries.

Of the 21 complicated subcutaneous ruptures, all died. In the vast majority of cases death was due to hæmorrhage, and far less often to abscess or peritonitis.

It is interesting to review the statements made by physiologists in reference to the function of the spleen, viz., (1) that it is concerned in elaborating the albuminous materials of the food, and for a time storing them up; (2) that it is probably engaged in the formation of white blood-corpuscles; (3) in the spleen many of the red blood-corpuscles undergo disintegration.

This patient, in spite of the loss of his spleen, is well nourished; his leucocytes are present in larger numbers than usual, and have been ever since the operation. His red cells are present in numbers slightly above the average, but among them abnormalities are found. The differential count yesterday being as follows:

Red blood-cells, 4,272,000; white blood-cells, 12,830; ratio, 1 : 330.

White Blood-Cells.—Lymphocytes, small, 15 per cent.; normal, 20 per cent. Large mononuclear lymphocytes and transition forms, 18 per cent.; normal, 10 per cent. Polynuclear, 65 per cent.; normal, 65 per cent. Eosinophiles, 2 per cent.; normal, $\frac{1}{2}$ to 2 per cent.

Red Blood-Cells.—Normal disks; nucleated reds; macrocytes; microcytes; poikilocytes.

At one period after the operation distinct enlargement of the thyroid gland was apparent, and almost all the usual regions presented palpable lymph-nodes.

DR. JOHNSON said he had seen five cases of ruptured spleen, —three uncomplicated and two complicated by other injuries. The cases were all subcutaneous; in two of them the diagnosis of ruptured spleen was extremely probable on account of the dulness and muscular rigidity of the abdomen just below the ribs on the left side. One of the patients was operated on by Dr. McBurney forty-eight hours after receipt of the injury. The patient was much exsanguinated, so much so that a saline infusion was necessary. The incision was made near the border of the ribs, and the spleen was removed. The hæmorrhage had ceased at the time of operation. The patient recovered.

The second case was operated on by Dr. Hartley. In that case the hæmorrhage had also ceased at the time of operation, which was done about twenty-four hours after the accident. The third uncomplicated case Dr. Johnson said he had operated on himself. The patient was a boy who was run over, and it was not supposed that he was seriously hurt. When the speaker saw him, some hours after the accident, he was in a state bordering on collapse. There was evidence of fluid in the abdominal cavity, with moderate distention, which was more marked on the left side: but there were no symptoms upon which to base a positive diagnosis as to the seat of the injury. When the abdomen was opened, the hæmorrhage was still going on. The spleen was ruptured, together with a large branch artery, which was bleeding at a point just before its entrance into the spleen. The bleeding was checked, the boy infused, and the spleen removed; but he lived only thirty-six hours.

Of the two complicated cases, one was operated on by Dr. Abbe. The injury was supposed to be on the right side of the abdomen, and an incision in that region disclosed one-half of the spleen lying in the right iliac fossa. Both the right and left kidneys were also ruptured, the latter so severely that it had to be removed. The spleen was also removed. The patient did not survive.

The second complicated case was operated on by Dr. John-



Fracture of radius with marked displacement and non union.

son a few weeks ago. A fracture of the pelvis was made out, with a large hæmatoma in front of the bladder, which suggested the probability of a rupture of that organ. Instead of this, however, a rupture of the deep urethra was found. Upon opening the peritoneal cavity, it was found to be filled with blood, and upon introducing the hand a ruptured spleen was made out. It was deemed inadvisable to do anything more than give a saline infusion, and the patient died a few hours later.

Dr. Johnson said that if these cases can be seen early enough, or if the hæmorrhage ceases, the spleen can be removed with a fair prospect of success.

DR. PARKER SYMS said that four years ago he had a case of this kind in a boy of twelve. In that instance the fracture of the spleen occurred from indirect violence. The boy was thrown a number of feet, receiving the force of the blow entirely upon the head and one shoulder, none on the abdomen. A diagnosis of internal hæmorrhage was made, and after an infusion the abdomen was opened, and a rupture of the spleen was found which involved the posterior portion of the organ. The condition of the patient was such that the possibility of removing the spleen before death occurred seemed remote. The blood was simply washed out and the wound packed. Complete recovery took place.

RESECTION AND WIRING FOR NON-UNION OF RADIUS.

DR. JOHN F. ERDMANN presented a man who had fractured his left radius on April 4, 1899, as the result of a fall. The fractured limb was put up in a permanent splint and kept in it for seven weeks. When Dr. Erdmann first saw him there was forward bowing of the forearm, with a marked point of motion about the mid-portion. An X-ray photograph showed over-riding of one and one-quarter inches, the lower fragment being between the ulna and the distal end of the upper fragment. (Fig. 1.)

On October 19, under ether, the radius was cut down upon and a dense fibrous band of union found between the displaced ends. This was cut away, and efforts at replacing without excision were made without success. Finally, seven-eighths of an inch was removed from the upper fragment, and three-eighths of an inch, with a spur half an inch long, was removed from the

lower fragment. Apposition was then possible. A silver wire was used to retain the ends in place. Some discharge was present from the centre of the cut for eight weeks. At the end of six weeks no union was observable. The patient was then put upon five-grain tablets of thyroid extract,—at first three times daily for a week, then four times daily for a week, and finally six times daily for a week. At the end of the tenth day of thyroid treatment the sinus had healed and union was taking place. The thyroid was discontinued after the fourth week. Sufficient union had been obtained at the end of the third week of thyroid treatment to remove the splints: this was the ninth week after operation.

DR. ALEXANDER B. JOHNSON referred to the difficulty of recognizing certain fractures of the forearm. When the fracture of the radius occurs at such a point that the upper fragment is acted on by the biceps and the short supinator, while the pronator radii teres remains attached to the lower fragment, it is necessary to strongly supinate the hand in order to get the fragments into apposition. The speaker exhibited two small radiographs to illustrate this condition. The patient from whom they were taken was a little girl who had recently fractured her forearm. The surgeon who had dressed the arm believed that he had reduced the fracture, but the fluoroscope showed considerable displacement of the fragments. In order to get the fragments into apposition, it was necessary to strongly supinate the hand, and at the same time exert a certain amount of traction.

PROSTATECTOMY.

DR. A. B. JOHNSON presented a man, sixty-one years old, who presented himself for treatment on October 2, 1899, with a history of difficult urination which had existed for a period of five years. Examination showed a prostate which was symmetrically enlarged; in addition there was a marked cystitis and five ounces of residual urine. The man was suffering a good deal; he was passing urine every few minutes, and was very anxious to submit to a radical operation.

The operation which he resorted to in this case, Dr. Johnson said, was a slight modification of the one suggested about a year ago by Dr. Parker Syme. Dr. Syme, in his paper on this subject, spoke of the practicability of making an incision above the pubes,

then opening the peritoneal cavity, inserting the finger and using it as a means of counterpressure for the purpose of enucleating the prostate. Dr. Johnson said it had occurred to him that it would be as safe, and certainly as convenient, to make a small incision above the pubes for the same purpose as that advised by Dr. Syms, but without opening the peritoneum or bladder. Accordingly, he adopted this method of operation. A U-shaped perineal incision was made, with its convexity directed forward, a sound having first been introduced into the bladder. The patient was a small man, and the perineal incision gave a very good exposure, so that the enucleation of the prostate was done absolutely under the eye. By means of the finger in the space above the bladder, first one side of the prostate was pushed down and excised, then the other. A drainage-tube was introduced through the membranous urethra. The patient remained in bed eighteen days. He is now able to hold his urine for long periods without discomfort, and it is entirely free from any catarrhal ingredients. The bladder still holds about a drachm of residual urine at times.

Dr. Johnson said that, while enucleating the prostate in this case, the prostatic urethra was unavoidably opened.

DR. WOOLSEY said that for the purpose of obtaining a means of counterpressure he opens the bladder by a suprapubic incision, and through this inserts the finger: he thought this method was preferable to the one followed by Dr. Johnson, or to that suggested by Dr. Syms. He had employed it for over four years, and had found it very satisfactory. In the perineum he makes a curved transverse incision, like that described by Dr. Johnson, which gives an excellent exposure. The work can all be done under the eye, without the necessity of depending upon the sense of touch, as is required when the vertical median incision is made. Dr. Woolsey said that he had also accidentally torn the prostatic urethra, as Dr. Johnson had done. Hence it had occurred to him that the removal of these masses by the scissors or knife would be just as effective and far easier. In his first case of prostatectomy, which he did a number of years ago, he employed v. Dittels's longitudinal incision, which embraces the anus on one side. This gave a good view of the prostate, and a V-shaped section was removed from both sides of the gland. The result was just as satisfactory as where the mass is shelled out, and it is certainly easier in certain cases. This method

of removing the prostatic tissue also appealed to Dr. Woolsey in view of the fact that in a recent case he found it difficult to shell out the lateral masses. This difficulty may have been the result of not incising the prostatic capsule deeply enough or in the proper place.

DR. BOLTON said he thought a suprapubic cystotomy in connection with prostatectomy preferable to any of the other methods suggested. An incision into the bladder itself adds but little to the gravity of the operation, while it affords the opportunity of examining and, if necessary, treating the intravesical part of the prostate; and, furthermore, it facilitates drainage. It thus offers distinct advantages over an incision in front of the bladder or through the peritoneum, and by means of it the prostate can be controlled just as well. Such an incision usually closes within ten days.

DR. MEYER said he recently saw a case of perineal fistula in a man of sixty-six years, with complete retention for the last four years, which communicated with an abscess surrounding an enlarged, hard prostate. When pressure was exerted through the rectum, pus could be expressed through the urethra. He decided to open the abscess and do a perineal prostatectomy. He made the transverse incision, which he always employs when operating for prostatic abscess. The capsule of the prostate was readily opened, and by means of pressure from the region just above the pubes the entire gland could be well brought down, so that both median and lateral lobes could be easily shelled out. Dr. Meyer said that if the patients were not too old, he would in a case of fibrous prostate favor excision of the gland, if possible, by the perineal route. But in those cases where the prostate is soft and glandular he preferred Bottini's operation, and was well satisfied with the results obtained with its help.

DR. L. W. HOTCHKISS said that in one instance he was able to do a complete prostatectomy through the perineum without the aid of pressure through an incision in the bladder or above the pubes. The speaker thought that through an incision in the perineum, like the one described by Dr. Johnson, a pretty complete exposure of the prostate could be made in a fair number of cases, and the prostate removed. He inquired whether Dr. Johnson had gained much in the control of the prostate by means of his suprapubic incision?

DR. JOHNSON replied that he had gained a great deal by means of it. The suprapubic wound healed entirely in one week.

CARCINOMA OF THE MALE BREAST.

DR. WILLIAM B. COLEY presented a man, twenty-two years old, whose symptoms dated back for three years. He states positively that he then had a small tumor, the size of a buck-shot, in the region of the waist-line, which gradually travelled upward until it reached a point about an inch and one-half from the left nipple. When it was about as large as a five-cent piece, it was removed by his family physician under cocaine. It recurred soon afterwards, and was again removed in June, 1899. The axillary glands were also removed at that time, and the wound in that region had never entirely closed.

The patient was recently referred to Dr. Coley by Dr. Bull. While there was no doubt as to the malignant nature of the disease, there was some question as to whether it was sarcoma or carcinoma. The patient's age favored sarcoma, but the general appearance of the growth (multiple small nodules, and very hard), together with the involvement of the axillary regions, rendered the diagnosis of carcinoma more probable. The entire pectoral region was thickened and somewhat infiltrated, and the glands in the opposite axilla were enlarged. The case was regarded as inoperable.

One of the small nodules was removed by Dr. Coley under cocaine, and the examination by Dr. B. H. Buxton showed it to be carcinoma.

DR. F. W. MURRAY said that two years ago, in his service at St. Luke's Hospital, he saw a man, forty-eight years old, who had a cancer of the right breast with marked involvement of the axillary glands. The malignant nature of the growth, which had been there for some time, was verified by the microscope. The man refused operation because he could not be positively assured that no recurrence would take place. He died about six months later, and at the autopsy it was found that the glands at the root of the right lung had also become involved.

DR. COLEY, in reply to a question as to the rarity of this condition, said he personally knew of only two cases in addition to the one just presented. In one case the patient died at the

age of thirty-six years, and in the other at the age of seventy years.

NOTE.—The most complete statistics place the relative frequency of cancer of the male breast to the female as 1 to 100.

DR. ERDMANN said he had operated on three cases of carcinoma of the male breast within the past few years.

DR. JOHNSON said his experience with carcinoma of the male breast was limited to a single case, upon which he operated some years ago. He was under the impression that that was the only case—with perhaps one exception—which had been seen at Roosevelt Hospital in over ten years.

DR. CURTIS said that, according to Williams, 1 to 100 was the proportion between cases of malignant disease of the breast in the male and female. The speaker said he thought this estimate was too low. Not infrequently these patients do not apply for relief until it is too late to operate. Dr. Curtis said he could recall in his own practice two such cases, both of which were inoperable.

DR. A. J. MCCOSH referred to a case of scirrhus cancer of the male breast which he removed some six or seven years ago. The growth was situated under the nipple, and was about the size of a dried fig. The patient was a Cuban, sixty-seven years old, who had since remained in good health.

DR. COLEY mentioned a case which was operated on by Dr. Bull at the New York Hospital.

DR. WOOLSEY said he had already reported one case which he operated on some years ago. The patient was over forty years old. He attributed his tumor to the irritation caused by the use of his tools in pressing against his right breast.

DR. CURTIS said he had under his observation at present a gentleman, eighty years old, who presents the lesion of Paget's disease of the left breast. It appears to be part of a chronic condition of the skin which the dermatologists have thus far been unable to classify. The latter resembles a psoriasis, with a tendency to the development of epithelioma. Otherwise, the patient is in very good health.

THYROID MEDICATION IN THE TREATMENT OF DELAYED UNION OF FRACTURES.

DR. F. W. MURRAY read a paper with the above title, for which see page 695.

DR. ERDMANN said that several months ago he saw a case of non-union of the right humerus of twelve months' standing. He regarded it as a case of fibrous non-union. The case was operated upon in August of 1899. The dense band of fibrous tissue, one half an inch in width, was removed. The fragments were brought into apposition and wired, and after four weeks, as there was still non-union, the patient was put on thyroid extract, five grains, *t. i. d.* Before the effects of this treatment could be ascertained, the patient had an attack of acute appendicitis and died.

In the case which he had reported at the present meeting, union took place so promptly after the use of the thyroid that the speaker said he could not attribute it to anything else.

DR. MURRAY said he had employed the thyroid in one or two cases of osteomyelitis with the object of filling up bone cavities. In one case where he operated last summer, quite a good-sized cavity was left in the humerus; partial healing took place; but subsequently it again became necessary to cut down and remove more dead bone. The cavity was then packed lightly with iodoform gauze and thyroid extract was administered, which apparently produced a marked diminution in the size of the cavity. In another case, in Dr. Weir's service, there was a large cavity in the tibia. The wound was first treated by packing, and progressed very slowly. The house surgeon then used thyroid extract, and from that time on the cavity filled up very rapidly. The wound is now practically healed, with the exception of a small spot.

Dr. Murray said he simply mentioned these cases in the hope that they might induce others to give this remedy a trial. Personally, he did not build any very high hopes upon it, and had simply resorted to it because other methods had failed.

MULTIPLE VESICAL CALCULI.

DR. ERDMANN exhibited eighty-five vesical calculi which he had taken from the bladder of a man seventy-four years old. The patient had enjoyed good health up to three years ago, when he entered into catheter life. Since then he had been obliged to use the catheter about every three hours. When he came under Dr. Erdmann's observation his symptoms pointed to the presence of vesical calculi, and upon the introduction of Thompson's

searcher this diagnosis was verified. A suprapubic operation was thereupon done, and these multiple calculi removed. The spicular condition of many of the calculi accounted for the pain of which the man had complained both before and after urination.

Stated Meeting, February 14, 1900.

JOHN D. RUSHMORE, M.D., in the Chair.

STAB-WOUND OF THE LIVER.

DR. ALEXANDER B. JOHNSON presented a man, aged twenty-one years, who was brought to the Roosevelt Hospital in the ambulance on the evening of January 4, 1900, with the following history. Shortly before admission to the hospital, while helping home a drunken male relative, this person drew a dagger and stabbed him in the abdomen. He was picked up by the ambulance and brought at once to the hospital. Upon admission, his general condition was good. He had not vomited blood; he had some shortness of breath and considerable pain in the abdomen. Upon examination a wound was found one inch in length, one inch below the tip of the tenth rib. There was considerable bleeding from this wound, and protruding was a mass of omentum which hung out a distance of several inches. Percussion of the thorax and abdomen yielded no abnormal signs. The respirations were 28 per minute; he was restless; temperature 99° F., pulse 70. The urine was normal. The patient was taken immediately to the operating room and etherized. The original wound was enlarged on a line parallel with the ribs to a distance of five inches.

Upon inspecting the cavity of the belly, a moderate quantity of free blood was found. The prolapsed omentum was tied off and removed. There was no wound of the intestine, gall-bladder, nor of the under-surface of the liver. At this time it was noted that blood was flowing freely from the upper surface of the liver, and a finger introduced between the liver and the diaphragm readily detected a considerable wound in the upper surface of the former, from which blood continued to escape rapidly. The original incision was extended vertically along the outer border of the right rectus muscle, a distance of two inches. The ribs were then drawn powerfully upward and the liver depressed, when

a wound in the upper surface of the liver, beginning about an inch from its free border and extending upward, outward, and backward, a distance of three inches. This wound appeared to be about one and a half inches in depth. Upon exploring it with the finger, the bleeding increased to an alarming degree. The cavity was hastily packed with sterile gauze, which being gradually removed, the wound was closed with five deep sutures of thick catgut passed through the substance of the organ. Upon tying the last suture, the bleeding ceased absolutely. The viscera in the neighborhood of the wound were then carefully washed with hot salt solution, and the wound in the abdominal wall was closed by suture with catgut of the several layers, the skin being closed by silk. A single strand of sterile gauze was led from the site of the wound in the liver through the original stab-wound in the abdominal wall. The patient suffered no shock from the operation. The healing of the wound was interrupted by slight superficial suppuration, confined to the neighborhood of the original injury. At the present time (six weeks after the date of injury) the patient is enjoying ordinary health. From the situation of the wound, a hernia seems to be an improbable sequence. Transitory glycosuria was noted on the day following the operation, which disappeared after forty-eight hours.

REMOVAL OF BULLET FROM UPPER PORTION OF FEMUR, TWENTY-THREE YEARS AFTER INJURY.

DR. WILLY MEYER presented a man, forty-two years old, who was accidentally shot in 1876 with a 44-calibre pistol-bullet, which entered the body just below Poupart's ligament, between the scrotum and the thigh. The ball was not located, and after four weeks the wound closed, without giving rise to the slightest trouble. Seven years later an inflammatory process occurred in the upper third of the thigh, accompanied by high fever, loss of weight, and occasional chills. A few days later an abscess formed, which was opened anteriorly by the patient's physician at his home in the South. The patient was kept in bed at that time for over two months: then, the wound failing to heal, he was sent to New York, where he placed himself under the care of two well-known surgeons, who, on account of the impaired condition of his general health, advised him to postpone any

further operative procedures and spend a few weeks in the country. In September, 1883, he was operated upon. Two incisions were made, one anteriorly, the other posteriorly, and a sequestrum removed. These wounds soon closed, and the patient went home with his health apparently entirely restored. He remained well until 1890 (seven years later), when the same trouble recurred. An abscess formed in the same region, which gave rise to severe constitutional symptoms. It was opened, and the patient again came to New York, where he was seen by another prominent surgeon, who also advised him to take a sojourn in the country. Upon his return to the city in the fall, a long posterior incision to the hip-joint was made, and a small sequestrum removed. The bullet was not found. He returned to his home and remained in good health until September, 1899, nine years later, when his trouble recurred for the third time. He came to New York and placed himself under Dr. Meyer's care, who, with the help of the X-rays, located the bullet, which was lying just below the minor trochanter. A long incision was made to the inner side of the sartorius muscle, and then a dissection was made through the cicatricial tissue resulting from the previous operations. It required a very deep incision before the minor trochanter was reached, where, in a nicely-formed funnel of bone, the bullet was found and extracted. The operation required for its removal was necessarily a delicate one, on account of the proximity of the wound to the large vessels. The wound, which was allowed to heal by granulation, closed in the course of three months, and the man is now entirely well. The strength of the psoas muscle was not impaired.

DR. JOHNSON said that in 1894 he removed a large Minié-bullet from the body of the ilium of a man who had been shot at the battle of Antietam, in 1862. It had remained quiescent for many years, but finally gave rise to an abscess formation about the crest of the ilium. Upon operation, the bullet was found just above the acetabulum. Its removal was followed by healing of the abscess and complete recovery.

RESULT AFTER RADICAL OPERATION FOR VENTRAL HERNIA.

DR. MEYER presented a woman, forty-five years old, who was operated on at one of the New York hospitals, on January 12,

1898, for a large dermoid cyst of the right side. The surgeon who operated had evidently been unable to close the abdominal wall, for when the woman was discharged, six weeks later, she had a hernia in the median line which readily admitted the entire hand, and through this the pelvic organs could be palpated with ease. The hernia gave the patient very much trouble, and she insisted upon further operative interference. Dr. Meyer thereupon operated on January 14, 1899. The operation proved very difficult on account of the number and firmness of the adhesions between the small intestines and the scar. The pedicle of the right tube was also adherent to the scar. The tube was again ligated, and, after freeing the adhesions, the peritoneum was closed by a continuous suture. Then the right and left recti muscles were loosened from their sheaths, drawn together and united by tier-sutures with strong chromicized catgut. The overlying fascia was also stitched and the greater part of the skin wound left open for drainage. The patient made an uneventful recovery, and now has a very firm abdomen. The present cure promises to become a permanent one.

Dr. Meyer also referred to a case in a very fat man where he had closed a large umbilical hernia by a similar method. The immediate result was excellent. But the patient, not heeding advice, returned to his work too soon after the operation. This brought on a sudden recurrence. The speaker also mentioned the procedure followed by an Italian surgeon, Giccoli, who strengthens the belly-wall in his radical operations for umbilical hernia by overlapping the two recti muscles.

POSTDIPHTHERITIC STENOSIS OF THE LARYNX.

DR. JOHN ROGERS read a paper with the above title, for which see page 547.

In connection with his paper, Dr. Rogers presented a number of patients and specimens.

DR. A. J. MCCOSH narrated the following case, which had recently come under his observation. The patient was a child, about a year old, who suffered from an attack of croup,—probably diphtheritic,—which was so severe that at the end of three or four days intubation was done by an experienced operator. While the tube was *in situ*, the breathing was comparatively free; a string was left attached to it, and by pulling on this it was with-

drawn a number of times by the child, and had to be reinserted. At the end of a week, while the attending physician was attempting to extract the tube, the child had an attack of vomiting, and the tube disappeared. It was surmised that the child had swallowed it; but immediately afterwards the breathing became more and more difficult, and a consultant was called, who examined the larynx but could find no trace of the missing tube. A second tube was thereupon inserted, but the breathing became still worse, and the child was taken to the hospital, where it arrived in an almost cyanotic condition. Immediately upon its arrival, the fluoroscope was used, which disclosed the presence of two intubation tubes in the larynx, the lower one just above the notch of the sternum, and the upper one practically in its proper position. The child was then taken to the operating-room, where Dr. McCosh made a rapid incision into the trachea and extracted the lower tube without much difficulty. The upper tube was also removed, and a tracheotomy tube inserted. Relief followed immediately, and the child was quite comfortable. Subsequently, frequent attempts were made to substitute an intubation tube for the one in the trachea, but without success; as soon as the tracheal tube was removed, the breathing became bad. The larynx gradually contracted, and in about eleven months it was so small that even a probe could not be introduced. About that time the child contracted pneumonia and died, and at the autopsy it was found that the entire larynx was filled with a mass of cicatricial tissue, so that it was impossible to force even air or water through it.

DR. RUSHMORE reported the following case which had come under his observation. The patient was a very nervous girl, who had been intubated for the relief of diphtheritic stenosis. The tube had been worn several weeks; and on two occasions, after its removal without an anæsthetic, very severe dyspnoea necessitated its reintroduction. The speaker was then asked to see the case, and he suggested that the tube should be taken out after the girl had been placed under the influence of an anæsthetic. This was done, and when the child returned to consciousness her breathing was perfectly free, and remained so. Dr. Rushmore said that the dyspnoea in this case was probably due to spasm of the glottis resulting from her struggling and nervousness.

Stated Meeting, February 28, 1900.

The President, B. FARQUHAR CURTIS, in the Chair.

NEPHRECTOMY FOR TUBERCULOUS NEPHRITIS.

DR. PERCIVAL R. BOLTON presented a man, forty years old, Italian, who, about eighteen months ago, began to suffer from frequency of micturition, which has continued. Urination is accompanied by a burning pain in the glans penis. His urine, which was at first clear, later became cloudy and foul. About three months ago pain of a constant, non-radiating character developed in the left lumbar region: it was slightly relieved by defecation, but uninfluenced by urination. The chief complaint was the lumbar pain.

Examination showed a retroperitoneal mass behind the colon, in the region of the left kidney, about the size of a cocoanut. His urine, at the time of admission, was amber in color, cloudy, and contained a light sediment. Its specific gravity was 1016. It contained neither albumen nor sugar. The microscope showed a few granular casts and pus-cells. Repeated search failed to show the presence of tubercle bacilli. The Harris segregator was employed several times, and the urine from both kidneys was found to contain inflammatory products. Both ureters were thereupon catheterized, and the specimens submitted to Dr. Fred-eric E. Sondern for analysis, who reported as follows:

"Specimen from Left Kidney.—The presence of a marked excess of albumen and granular casts, together with the low gravity, polyuria, relatively low amount of urea, etc., tubular plugs of pus, and groups of epithelial cells, presumably from the renal pelvis, would, I believe, indicate a chronic pyelonephritis.

"Specimen from Right Kidney.—The presence of a faint trace of albumen and few hyaline and epithelial studded casts would indicate some hyperæmia of the renal parenchyma. This I believe is no uncommon occurrence in a kidney doing the extra work. There are no evidences of a lesion of the renal pelvis.

"Ætiological Factor.—A repeated, painstaking search for men shows evidences of some chronic cystitis.

"Ætiological Factor.—A repeated, pains-taking search for tubercle bacilli in all three specimens resulted negatively. Re-

maining sediments from bladder specimen and left kidney specimen were digested with NaOH, boiled, sedimented by centrifuge, stained for twenty-four hours, and searched for bacilli with likewise negative result. Other pathogenic organisms, evidences of stone or elements of pseudoplasm, could also not be found.

"Conclusions.—Right kidney, some hyperæmia of parenchyma; Left kidney, chronic pyelonephritis; Bladder, some chronic cystitis; *Ætiological factor, not found.*"

Upon receipt of the above report, Dr. Bolton, assisted by Dr. Alexander, did a nephrectomy on the left side. The wound was allowed to granulate, and the man made an uneventful recovery. The organ removed was submitted to Dr. James Ewing for pathological examination, who reported as follows:

"The kidney is considerably enlarged, measuring 14 x 8 x 7 centimetres. The lower half is much the larger, and its surface presents several rounded eminences, which mark the seat of various necrotic areas which are surrounded by a thin layer of inflamed renal tissue, filled with semifluid pus and caseous material. On section, this half of the kidney is seen to be converted into three distinct and several smaller cavities, one of which is larger than the others, is empty, and communicates with the pelvis. The walls of all these cavities are very actively inflamed, covered with necrotic material and blood, and on microscopical examination they are found to contain numerous miliary tubercles. They do not, apparently, communicate with each other, but the external covering of one is very thin, and at one point is ruptured (artificially?). Smears of the contents showed neither tubercle bacilli nor other bacteria, after a lengthy search. In the sections, however, tubercle bacilli were demonstrated in the miliary tubercles."

Dr. Bolton said that about two weeks ago this patient returned to him suffering from an acute epididymitis of the left side, with involvement of the corresponding vas and seminal vesicle. The speaker thought the inflammation of these organs was probably tuberculous in character.

DR. HOWARD LILIENTHAL said he recently read a paper before the Genito-Urinary Section of the New York Academy of Medicine, in which he deprecated catheterization of a healthy ureter through diseased or infected tissues. The speaker said that this procedure was far from being devoid of danger, and

lately cases have been reported where there was undoubted infection of a healthy ureter following catheterization. As a routine method of diagnosis, catheterization of a presumably healthy ureter was certainly inadvisable. In Dr. Bolton's case, for example, the symptoms, as well as the presence of a large tumor on the left side, fully justified an operation on that side without catheterizing the right ureter. It has been shown that tubercular infection of the ureter may take place long after the catheterization, and still be due to it. In a case where it is important to learn whether the opposite kidney is in working order, an exposure of the organ would be preferable to subjecting a healthy ureter to the danger of possible tubercular infection by catheterization.

DR. F. KAMMERER said he did not entirely agree with the remarks made by Dr. Lilienthal. In a case like the one under discussion, a nephrotomy alone would not give the desired information. We want to know whether there are any tubercle bacilli in the urine from the kidney under investigation, and merely cutting down on the kidney would not give us this information, and still the organ might be diseased to such an extent that removal of the opposite kidney would be contraindicated.

The question of the possible danger of infecting a healthy ureter by catheterization, Dr. Kammerer said, was discussed about a year ago at one of the Berlin medical meetings. Casper, Israel, and others took part in that discussion, and it was acknowledged by the majority of those present that the danger of such infection was not very great, at all events out of proportion to the value of the information gained. Dr. Kammerer asked Dr. Lilienthal upon what authority he based his statements.

DR. LILIENTHAL said he had read the discussion to which Dr. Kammerer referred, and a summary of it was included in the speaker's paper on the subject, which will shortly be published in the *Journal of Cutaneous and Genito-Urinary Diseases*. Since that discussion took place, Israel has reported one extremely bad case of infection of the ureter due to catheterization, and still more recently König has taken precisely the stand which the speaker was advocating.

When we have to deal with an enlarged and very badly diseased kidney, which is probably not doing any work, an exposure

of the opposite kidney—not a nephrotomy—will be very apt to show whether the condition of that kidney is sufficiently normal to do the work.

Dr. Lilienthal said that while catheterization of a healthy ureter through infected or diseased tissues may occasionally be justifiable, still, such a procedure is rarely necessary, and it should only be done after the most careful consideration. In the past it has been done entirely too frequently, and it is generally regarded as a harmless procedure because the punishment has not immediately followed the offence.

Dr. BOLTON, in reply to the remarks made by Dr. Lilienthal, said it was thought advisable to catheterize the right ureter, because a great deal of doubt existed as to the condition of the right kidney, although it was not palpably enlarged and not at all tender. The danger of infecting the ureter by catheterization he thought was comparatively slight, as repeated examinations had failed to show the presence of tubercle bacilli in the urine.

OPERATION FOR FRACTURE OF THE EXTERNAL CONDYLE OF THE HUMERUS.

Dr. L. A. STIMSON presented a boy, six years old, who sustained an injury of his left elbow. He was brought to the Hudson Street Hospital, where an examination revealed a fracture of the external condyle of the humerus. The displacement of the fragment was such that it threatened the usefulness of the joint. Dr. Stimson thereupon made an incision along the outer side of the joint, and replaced the fragment in its proper position. The fractured surface of the bone was found lying directly underneath the skin. It was easily turned back into place and held there by a few sutures through the fibrous tissue. The boy made an uneventful recovery, and has regained a fairly normal limb. He left the hospital two months ago. Flexion and extension are still somewhat limited.

Dr. CURTIS said he was very glad to have Dr. Stimson's authority for cutting down on fractures which produce a certain amount of deformity and which cannot be reduced in other ways. The speaker said he thought such operations should be done more frequently than they are.

ARTERIOVENOUS ANEURISM OF THE FEMORAL VESSELS.

DR. L. A. STIMSON presented a man, thirty years old, who was shot about a year ago, the bullet entering the left thigh posteriorly, just below the great trochanter, and emerging on the inner side of the thigh just above the knee. He recovered from his wound, but subsequently developed all the characteristic features of an arteriovenous aneurism of the femoral vessels. The limb showed but little swelling, and there was no recognizable dilatation of the veins. A thrill could be felt over the inner upper two-thirds of the thigh. About two inches above the point of emergence of the bullet pressure would arrest the thrill.

Dr. Stimson exposed the artery by an incision along the outer side of the sartorius; his idea in approaching the vessels from that side being to avoid encountering the vein first. No tourniquet was applied, and the artery was found without any difficulty. A ligature was then passed around the artery about an inch above the point of communication between the artery and vein; then, without tying this ligature, so that the artery could be readily traced downward by its pulsations, a second ligature was passed around it about an inch *below* the point of communication with the vein. Both ligatures were then firmly tied. The man made an uneventful recovery, and was discharged, cured, during the second week after the operation. He has remained well ever since.

As to the best method of treating these lesions various methods have been advocated, notably that which Dr. Curtis had done much to popularize, namely, the application of four ligatures, tying off the vein and artery separately, both above and below, and then extirpating the sac and the occluded portions of the vessels. The speaker said he could conceive of cases where such a procedure would be preferable to simple double ligation, but at the same time an operation which does not interfere with the vein is less likely to cause subsequent trouble. By a simple double ligation of the artery, without touching the vein, there is less interference with the circulation, and the danger of gangrene is diminished.

DR. B. F. CURTIS said he had looked up the history of cases

of this character some years ago, and his recollection was that he had chosen the method by extirpation because those cases which had been treated by simple double ligation were not permanently relieved. The recurrences were due to the presence of small communicating branches of the artery, which restored a collateral circulation, and the distention of the sac and the venous hum continued. The double ligation method would be very satisfactory if we could be certain that there was no collateral circulation.

DR. STIMSON said that in the case reported he had believed that the circulation could not be re-established by collateral branches between the ligatures, at least to any troublesome extent. He had seen this occur in a similar case where he had resorted to the same procedure, but the symptoms never became prominent. The speaker also referred to another case where he had tied the common carotid above the point of communication with the vein, and the internal and external carotid beyond it, and subsequently there was a return of the thrill and hum, which could be arrested by pressure over the thyroid isthmus, showing that a collateral circulation had been established through the superior thyroid. It is true that a recurrence may follow simple double ligation. On the other hand, tying off the vein is a serious and sometimes a very bloody operation.

MUSCULO SPIRAL PARALYSIS.

DR. L. A. STIMSON presented a young man who fractured his left humerus last summer, and three or four weeks later musculospiral paralysis was observed, which finally became complete, so far as motion was concerned. In November, 1899, the nerve was exposed. It was traced upward to a bony canal, which was chiselled away and the nerve released. The wound healed without accident, and motion in the muscles began to return about a month later. The improvement continued, and at the present time the return of motion is practically complete.

In a second case, seen in December, the symptoms of musculospiral paralysis appeared in the same way some weeks after the receipt of the injury. When the nerve was exposed, it was found to be undivided and free from the bone, but for a distance of fully an inch it was imbedded in dense cicatricial tissue, from

which it was released. Two months have elapsed since the operation, and thus far no improvement has been observed.

DR. CURTIS said he thought there was still hope for the second case reported by Dr. Stimson. In a similar case which had recently come under his observation, the nerve had been pushed upward over one of the fragments, where it was pressed upon by fibrous tissue. After its release there was no improvement in the symptoms for over two months; then motion began to return, and was practically complete within a month.

DR. STIMSON said that in one of his cases restoration of function followed nearly a year after operation.

DR. KAMMERER said that in a case of musculospiral paralysis, which was sent to him for operation eight or ten months after receipt of the injury, he thought it wise to postpone operative interference, and three months later there was a complete recovery.

The speaker said he had under his care at the present time a case of supracondyloid fracture, with complete paralysis of the median nerve, which has now lasted between four and five months. There is slight displacement of the upper fragment anteriorly; but he did not think that had anything to do with the maintenance of the paralysis. The loss of power followed immediately after the injury.

DR. STIMSON suggested that in Dr. Kammerer's second case the nerve was probably ruptured.

DR. KAMMERER said it was perhaps only contused.

DR. CURTIS asked Dr. Kammerer what induced him to delay operation in his first case? Whether he would postpone operation for a year in the hope that the nerve would regenerate itself, or operate immediately?

DR. KAMMERER replied that the time of operating would of course depend much upon which nerve was affected. In cases of musculospiral paralysis, it seemed to him easier to cut down and expose the nerve. With the median this would probably be more difficult. The speaker said that in the first case which he reported he was induced to postpone operating because some improvement had been noticed in the electrical reaction of the affected muscles.

DR. L. W. HOTCHKISS mentioned a case of gunshot wound of the leg in which the peroneal nerve was involved, there being

complete paralysis of motion and sensation, *i.e.*, drop-foot. It was supposed before operation that the nerve had been divided by the Mauser bullet; but it was found on cutting down upon it that its continuity was apparently uninterrupted. The nerve had been undershot, and probably contused and lacerated within its sheath. It was carefully freed from the surrounding connective tissue which bound it down, stretched, and the wound closed. Sensation returned, but at the last report, about eighteen months from date of operation, the motion had not been regained.

DR. STIMSON said he had seen complete and permanent musculospiral paralysis following fracture of the humerus, without, apparently, any injury to or interference with the nerve, which he exposed for a distance of two inches above and below the level of the fracture. Of course, the nerve had probably been bruised, but it could not be made out macroscopically.

FRACTURE OF THE OLECRANON.

DR. PARKER SYMS presented a man, aged twenty years, who came under observation October 15, 1899, with the following history:

Six weeks ago he fell off his bicycle and struck his left elbow. This was soon followed by marked swelling of the arm and forearm. He was seen by a physician, who applied a simple roller bandage, and advised the application of an ice-bag, and later some liniment. At that time he could flex and extend his forearm, but had considerable pain on flexion. At the end of the third week the swelling had disappeared, and he discovered a projection in the region of the left olecranon. A week later he struck the same elbow against a piano, and found that the point of the projecting body tore through the skin. On examination, a small wound was seen, which was infected and discharged some sero-pus. The upper fragment of the olecranon could readily be moved from side to side, and on extending the forearm could be pressed into its proper position. There was very little pain and not much interference with function.

A diagnosis of ununited fracture of the olecranon was made, and the limb placed in full extension, after thoroughly cleansing the small wound on the back of the elbow. This healed in about ten days, and on November 1, 1899, he was operated upon under ether anæsthesia.

An incision two inches in length was made down to the bone. The periosteum was elevated and an ununited fracture of the olecranon exposed. The fracture was oblique from above downward and ran from the anterior surface backward. The fragments were scraped and the lower one drilled. A catgut suture was passed through this hole, and the small upper fragment brought into position and held there by tying the catgut over it. The skin was united by catgut sutures. The limb was placed in full extension and a plaster-of-Paris case applied. The wound healed by first intention. The case was left on for about five weeks. After its removal he regained considerable range of motion, there being firm union of the bone.

About eight weeks after he left the hospital, while boarding a train, he fell. In falling he held his arm extended so as to protect himself. He landed on the palm of his hand, and felt a cracking sensation at the site of the old fracture.

He was readmitted to the hospital on January 22, 1900. On examination the olecranon was again found to be broken. He was operated upon on January 24, 1900. This time a catgut suture was passed through the lower fragment and the fibrous tissue around and above the olecranon process. Plaster-of-Paris case in extension. Primary union.

The present condition of the part is good. There seems to be a firm bony union. As the arm has been out of a splint but a few days, there is still present some stiffness and limited function.

DR. STIMSON referred to a case of fracture of the olecranon which he saw a few months after it had been treated by wiring, and which resulted in permanent ankylosis in full extension of the limb. A radiograph showed that the wire passed into the joint.

DR. LILIENTHAL said that some years ago he had presented a case which was almost identical with the one shown by Dr. Syms. In that case, the speaker said, he brought the fragments together with silver wire, which was passed through a transverse drill-hole in the olecranon and another in the stump of the ulna. Perfect union and complete motion resulted: so much so, that only a very close examination would disclose which arm had been injured. The wire is still in place.

CANCER OF THE STOMACH—PYLORECTOMY.

DR. B. FARQUHAR CURTIS presented a woman, aged thirty-eight years, who was admitted to St. Luke's Hospital October 22, 1899, stating that her present illness began twenty-one years ago, with "heart-burn" and flushing of face after eating, but she did not lose flesh until the last thirteen months. Weighed three years ago 210 pounds, present weight 120 pounds.

For the last two years has had nausea, vomiting, pain after eating. Vomited matter very acid, has reached amount of a quart at a time. Vomiting followed every meal. Does not recollect vomiting any food eaten the day before. Six months and three months ago vomited dark material and some blood-streaked mucus. Last week had "black" vomit for three days. Appetite fair; at times very hungry. Bowels regular. Patient was of large frame, rather poorly nourished, no marked emaciation. Pale. Tongue coated with whitish fur. Heart and lungs normal. Abdominal examination showed no tumor until stomach was inflated, when a mass one and one-half inches in diameter was felt below the border of the liver, almost in the mammillary line. No retroperitoneal glands could be felt.

Urine acid. specific gravity 1010, no albumen, no sugar. Stomach contents after test meal separate into three layers (typical of retention). Starch digestion good. Vomiting and pain in stomach continued during the interval before operation in spite of fluid diet and lavage. Operation, October 28; ether. Median incision five inches in length. Mass found growing from anterior wall of stomach at pylorus about three inches across. Some infiltration of omentum. No glands found. The tumor was removed with free excision of stomach, about one-half of it being removed, by Kocher's method, using a Murphy button to unite duodenum to posterior stomach wall. Three tiers of silk sutures closed the end of the stomach. The point of insertion of the button was reinforced by Lembert sutures (continuous fine silk) and by a strip of omentum. Abdomen closed with three tiers of sutures. Patient reacted well from the shock, but required much morphine for pain. Rectal feeding was begun at once. Milk given by mouth in small doses, and gradually increased.

November 8, enemata stopped.

November 13, wound dressed. Primary union.

November 29, patient left hospital, weighing 110 pounds.

February 28, 1900, patient weighs 160 pounds, has no digestive disturbance, looks and feels in good health. The Murphy button has never been seen, although careful watch has been kept for it.

DR. KAMMERER said the method of anastomosis followed by Dr. Curtis in the case he reported was practically that of Carle and Fantino, which the speaker said he had employed in about a dozen cases, mostly cases of gastro-enterostomy. The results of this method he had found very satisfactory. It does away with all puckering of the gastric wall, which he had hitherto found to be such a great inconvenience in joining the two halves of the Murphy button. The method gives a smooth surface, and renders the application of auxiliary sutures entirely unnecessary.

NEPHRECTOMY FOR SUPRARENAL TUMOR.

DR. CURTIS presented a woman, forty-nine years old, who was admitted to St. Luke's Hospital in November, 1898. She had passed the menopause three years before, and gave a rather indefinite history of stomach disturbance. She was somewhat emaciated.

Examination showed a tumor, about as large as a child's head, in the region of the right kidney. It was fairly well fixed, and the descending colon could be traced over it anteriorly; ballottement could be made with the hand in the lumbar region. The patient was constipated, and for about ten months past she had complained of a sense of uneasiness in the region of the kidney; otherwise, there were absolutely no symptoms of renal trouble. An examination of the urine proved practically negative; its specific gravity was 1026; it contained a trace of albumen and a few isolated red cells.

The kidney was removed on November 19, 1898. She made an excellent recovery, and has remained in good health since. The tumor weighed two pounds and twelve ounces; it measured sixteen inches in one diameter and seventeen inches in the other. A pathological examination of the growth showed that it originated in the suprarenal body, and that the kidney had been partly pushed aside and partly involved.

About a year and a half has elapsed since the operation;

the scar has almost disappeared, and there are absolutely no signs of a hernia.

Dr. Curtis said that while tumors of the suprarenal body are not uncommon, we have not yet been able to distinguish clinically between them and true kidney tumors, excepting in those cases where the kidney has retained its form and can be felt attached to the tumor. These suprarenal tumors offer a very bad prognosis, and frequently give rise to metastases.

Dr. BOLTON said that three or four years ago he had occasion to remove a malignant tumor of the kidney which was composed of atypical suprarenal tissue. The speaker said he discovered at that time that considerable uncertainty existed among pathologists as to the exact nature of these growths. Delafield and Prudden classified them as adenomata, Lubarsch regarded them as carcinomatous, and Sutton as sarcomatous.

Dr. ROBERT ABBE said the unfavorable prognosis which Dr. Curtis referred to in connection with tumors of the suprarenal bodies might not be borne out in occasional cases. In corroboration of this, the speaker referred to a case which he had placed on record some years ago, namely, that of a child with a sarcoma of the kidney weighing seven pounds and a half. The operation was done over eight years ago, and thus far there have been no evidences of a recurrence. In that case, Dr. Abbe said, he thought the tumor was of suprarenal origin, although it had become amalgamated with the kidney. Microscopic examination showed that it was a rhabdo-myo-sarcoma, the sarcomatous tissue predominating. In a table of similar cases recently reported in France ("*Tumeurs Malignes du Rein*," Pierre Heresco, Paris, 1899, pp. 25), six and one-half years had elapsed without recurrence in one, and in several cases three and one-half years, three, and two and one-half years had passed.

RECURRING STONE IN THE BLADDER.

Dr. BOLTON presented an Italian boy, sixteen years old, who first came under observation on September 16, 1898, with the history that during the past six years, but more especially during the past two years, he had had more or less pain in the pelvic region, which was almost constant, day and night, especially when he moved. He also had trouble in urinating: the stream

would stop short, and he would have to wait and move about before he could finish.

The presence of a stone in the bladder was readily made out by means of Thompson's searcher. On September 17, 1898, after an unsuccessful attempt to remove the stone (owing to its size) through a perineal incision, the bladder was opened above the pubes, a median incision three inches long being made. Through this the stone, which weighed four ounces, was removed. The suprapubic sinus closed on October 23; the perineal wound somewhat later. The patient was discharged cured on December 3, 1898. He returned to the hospital on July 24, 1899, complaining of symptoms which pointed to the presence of another stone in the bladder. This diagnosis having been verified by means of Thompson's searcher, the bladder was again opened above the pubes on July 25, and a calculus (probably phosphatic) about an inch and one-half in length and one inch wide was removed. The patient was discharged cured on August 21, 1899. Dr. Bolton said he would probably return in the course of time with another vesical calculus, as his urine persists in remaining alkaline, in spite of various methods employed to render it acid in reaction.

In connection with this case, Dr. Bolton exhibited the specimens removed.

RESECTION OF POPLITEAL ANEURISM.

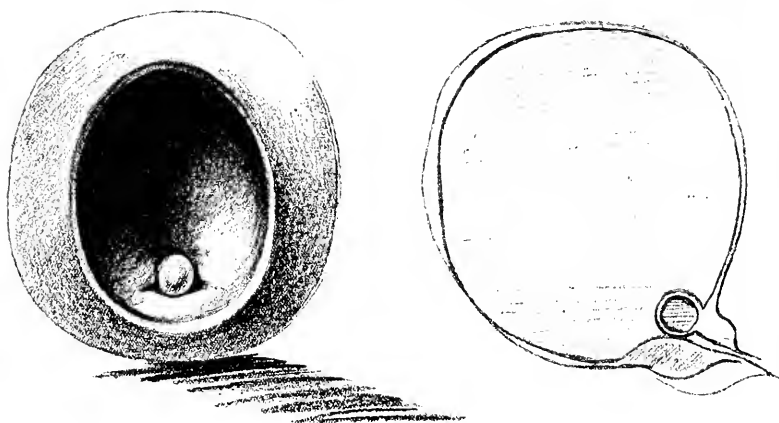
DR. ROBERT ABBE presented a man, thirty-five years old, with no specific history, who had an aneurism of the lower third of the femoral artery which began at the foramen of Hunter's canal and extended into the popliteal space. Dr. Abbe resected the popliteal sac, which he found to be a very satisfactory method. The diameter of the artery at the lower part of the aneurism was larger than that of entrance into the sac, which suggests a possible early recurrence if the artery had been ligated above without excision.

The aneurismal sac which Dr. Abbe exhibited was filled with plaques and clots, forming a very pretty net-work, which was evidently in existence before the operation.

CYST OF THE PROSTATE PRODUCING URINARY OBSTRUCTION.

DR. ABBE showed a drawing of a cyst obstructing the internal urethral opening which he had recently removed. The patient was a man, thirty-five years old, who first suffered from retention of urine about a year before, which was relieved, but required the subsequent use of the catheter. The bladder constantly contained about a pint of residual urine, for which no adequate cause could be assigned. There were no evidences of stone, no enlarged prostate, and the only plausible explanation was that the case was one of persistent atony of the bladder following over-distention.

As the symptoms could not be otherwise relieved, a supra-



Prostatic cyst producing urinary obstruction.

pubic cystotomy was done in order to explore the bladder. This showed the presence of a tumor, exactly the size of a cherry, which sprang, apparently, from the upper wall of the internal meatus; practically, from the upper part of the prostate, and acted as a ball-valve, obstructing the outflow of urine. Upon transfixing the tumor with a hook, it grew smaller and smaller, and gradually emptied itself through the hook puncture. The sac was then tied off and cut away. The patient was immediately relieved of his urinary symptoms, and has remained well ever since.

Dr. Abbe said that in doing a suprapubic cystotomy, he has

for years applied a purse-string suture around the exploratory incision in the bladder wall where he wishes to insert the drainage-tube, following precisely the same plan as in operations on the stomach and gall-bladder. By this means the bladder-wall is inverted by tightening this stitch round the catheter, and closes at once after the catheter is removed. In this way no urinary sinus remains longer than a few days.

SARCOMA OF THE OVARY.

DR. C. L. GIBSON exhibited a sarcomatous ovarian tumor removed from a woman, thirty-two years old, who was operated on by him a week previous. She had had three children, the last one seven months ago. The tumor of the ovary was first noticed three months ago. There were no adhesions, and it was removed without difficulty. Cases of sarcoma of the ovary are rather rare, the speaker said, occurring about once in every one hundred cases of ovarian tumors. Their malignant nature is rather uncertain, as about fifty per cent. of permanent cures have been reported (Pfannenstiel). Cases have been noted where the patients remained well for ten years. Young women and children are the ones usually affected. A case has been reported in a fœtus of seven months.

TUMOR OF THE SIGMOID.

DR. GIBSON said that about a week ago he was called upon to operate upon a man who presented a large mass in the left iliac fossa, which was diagnosed as a tumor of the sigmoid. Upon opening the abdomen, this diagnosis was verified; but the condition was inoperable, as the intestines, both large and small, were closely fused into this mass. Temporary relief was given by the formation of an artificial anus.

A very excellent view of the field of operation was obtained by the use of the sigmoidoscope, through which the bowel was inflated and illuminated.

FIBROMYOMA OF THE UTERUS.

DR. GIBSON also showed a large fibromyoma of the uterus which he had recently removed from a colored woman. The intestines and omentum were fused into all the recesses of the tumor, and the adhesions were found to be so firm that, instead

of separating them, in some places he stripped off the capsule of the tumor and left it behind. At the time of operation the patient was very anæmic, but she made a good recovery. There were some fifty different tumors of varying sizes and shapes, most of them with slender pedicles.

Dr. Gibson also showed a large gall-bladder, filled with gall-stones, which had never been opened. He had removed it by cholecystectomy, from a young woman who had been sent to the hospital as a case of acute appendicitis. There was tenderness over the entire right side of the abdomen. [The diagnosis not being established, operation was deferred. Patient's temperature fell the next day from 103° to 100° F., with general remission of symptoms; but on the succeeding day new access of fever, and exploratory laparotomy performed.] Dr. Gibson opened the abdominal cavity midway between the appendix and the gall-bladder. The former was found to be healthy, but the gall-bladder was enlarged, filled with calculi and considerable pus, so that it was thought advisable to remove it. Uneventful recovery, except for a temperature of 105° F. twelve hours after operation.

Three months ago, Dr. Gibson said, this woman had had her ovaries and tubes removed; and the speaker thought that possibly the real seat of her trouble at that time was the inflamed and distended gall-bladder.

CHOLECYSTECTOMY AND CHOLEDOCHOTOMY.

DR. GIBSON reported the history of an elderly woman with jaundice of many months' duration. When the abdomen was opened by an incision parallel to the ribs, there was found to be a small atrophic gall-bladder, the size of a green-gage plum, filled with stones. A calculus, the size of a cherry, was impacted in the common duct, and a smaller one in the cystic duct. The common duct was incised and both stones removed. The patency of the duct was further verified. The opening in the common duct was united by two rows of sutures. The gall-bladder was excised, though not without difficulty; but there seemed no better way to deal with it.

PERFORATING TYPHOIDAL ULCER.

DR. GEORGE WOOLSEY reported the case of a young man, twenty-eight years old, who had been ill about three weeks with

what his physician first regarded as grippe and then as malaria. His condition growing worse, two eminent consultants were called in, who found the patient suffering from septic peritonitis, the cause of which could not be made out, although appendicitis was suggested. It was determined to operate, and Dr. Woolsey was called in. The patient's general condition at this time was very bad. Upon exposing the appendix, it was found to be normal. There were no signs of intestinal obstruction or internal strangulation. The mesenteric glands were found to be large and swollen, and there was sero-pus in the pelvis, indicating a lesion of the small intestines. Examination of the latter was begun, but at this stage of the operation the man's condition became so serious that further interference was contraindicated: the peritoneal cavity was washed out with hot normal saline solution and the wound closed, strips of gauze being left in for drainage. Death occurred in thirty-six hours.

The autopsy disclosed a single perforation in the lower ileum. But few other Peyer's patches were involved so as to be visible from the outer surface. The microscope showed that the ulcer surrounding the perforation was typhoidal in character.

INDEX TO SURGICAL PROGRESS.

ABDOMEN.

I. A Contribution to the Surgery and Pathological Anatomy of Intussusception. By DR. CONRAD BRUNNER (Münsterlingen). One case was diagnosticated as an invagination caused by a carcinoma of the rectal wall. A parasacral incision was made, followed by posterior proctotomy, and amputation of the tumor. Suture of the peritoneal coat of the intussusciptiens to the intussusceptum, whereupon the bowel retracted itself into the peritoneal cavity. A laparotomy was done to revise the line of suture, and to guard against pressure on the line of suture by the fæces, colostomy was performed. After the fifth day the bowel was moved by enema; three months later the artificial anus was closed by suture. In the second instance, proctotomy was followed by amputation of the invaginated bowel with the tumor; but since some of the invagination was still irreducible, laparotomy was resorted to, and again reduction was impossible; therefore colostomy was a last resort. Two weeks later the invagination was passed by anus, and ten weeks thereafter the artificial anus was closed by suture. The other two cases in adults were examples of the ordinary ileocaecal invagination peculiar to childhood. A most unique feature in one case was the presence of an accessory pancreas adherent to the blind end of a Meckel's diverticulum which started the invagination. As the conditions were acute, laparotomy was the first indication, and in both instances resection was performed, this being the only rational procedure, since colostomy alone, leaving the invagination to be passed per anus, is uncertain, and carries with it the addi-

tional danger of perforation into the peritoneal cavity. The same holds good for anastomosis and intestinal exclusion. It is of great importance in resection to determine the limits of gangrene. —*Beiträge zur klinischen Chirurgie*, Band xxv, Heft 2.

MARTIN W. WARE (New York).

II. A Characteristic Species of Femoral Hernia as a Result of the Bloodless Method of Treatment of Congenital Dislocation of the Hip. By A. FARATH (Utrecht).

This peculiar hernia was observed six times in four patients, out of a total of forty-seven patients with sixty-five dislocations. The ages of the children at the time of the appearance of the hernia were seven, eight, and eleven years.

In nearly all the cases treatment was begun by traction on the limb (mechanical or manual), then abduction to ninety degrees, with kneading and pressing of the adductors, and, finally, the actual reposition manœuvres according to Paci, Lorenz, or other methods.

The femoral herniæ, which were not detected till the expiration of six months, present the same type. They are situated just below Poupart's ligament, their base being six to seven centimetres broad; they are on front of the vessels and nerve, and extend several centimetres downward. The herniæ are generally empty or nearly so, only becoming prominent on coughing or exertion; this is probably the reason why they have escaped the attention of other observers.

The origin of this particular form of hernia is to be sought in an extensive damage to the individual portions of the crural opening, as a result of the various mechanical results consequent on the bloodless method of reduction. Such are great traction on the limb, marked abduction, kneading, and pressing of the insertions of the adductors and the tensor vaginæ femoris, fixation of the pelvis by the process of reduction, the prominence of the head of the femur in the groin, the bringing together of the insertions

of the psoas iliacus and pectineus, the long-continued fixation of the hip in the plastic splint. These various disturbing features bring about a tearing, pushing aside, loosening, and atrophy of the crural arch and the sheath of the vessels, and thus give rise to a protrusion of the peritoneum beneath Poupart's ligament.—*Verhandlungen des deutschen Gesellschaft für Chirurgie, XXVIII Kongress.*

GENITO-URINARY ORGANS.

I. Dissemination and Prognosis of Cancer of the Penis.

By DR. KUTTNER (Tübingen). Two recent cases of cancer of the penis in the Tübingen clinic were attended with features of great significance as regards the invasion of the lymphatics. In the first case, the organ was almost entirely removed, and the inguinal glands on the left side were cleared out. There was an early recurrence under the anterior abdominal wall in the pre-vesical region, but neither the penis nor the inguinal glands were implicated and remained free during the rest of the patient's life. In the second case,—amputation for a small growth,—the inguinal glands were not enlarged and were not removed. Two years later, there were marked evidences of implication of the pelvic lymphatics. Six months later, shortly before death, the inguinal glands became involved.

These cases would seem to differ from the usual experience, that cancer of the penis acts in the opposite manner from cancer of the testicle, in that the inguinal glands are first implicated, and the pelvic glands secondarily.

Experimental work on the lymphatics of the penis shows that it has a superficial and deep chain of lymph vessels. The first variety is of little interest; the vessels empty into the inguinal glands. The deeper chain derives its principal origin from the glands, whose lymphatic channels communicate also with those of the urethral mucous membrane: they form a subfascial group accompanying the dorsal vein. A large proportion of this lymph

finds its way into the inguinal glands, the other lymph channels empty into the glands in the interior of the pelvis, the *modus operandi* being as follows: a lymph vessel passes behind the spermatic cord and under Poupart's ligament, and terminates in one of the glands adjoining the external iliac vein. A lymph vessel accompanying the dorsal vein reaches the anterior surface of the symphysis pubis where a small gland is situated. The lymph trunk emerging from this plexus passes over the symphysis between the recti muscles, and runs on the inner aspect of the abdominal wall, parallel to the pelvic brim, and to the left it divides into branches, one of these passing into the lesser pelvis ends in a hypogastric gland, the other in a gland somewhat to the median aspect of the spermatic vessels. Still another vessel, at the root of the penis, is directed externally, passes over the insertions of the adductor and pectineus muscles, reaches the large blood-vessels and accompanies them to a group of glands situated at the point where the ureter crosses the iliac vessels. The lymphatics of the urethral mucous membrane pursue a different course. A lymphatic vessel accompanies the dorsal vein but passes below instead of above the symphysis, and terminates in a plexus around the distal portion of the prostatic urethra. From this plexus issue two large trunks. One goes diagonally to the anterior abdominal wall and downward, terminating in an iliac gland located on the horizontal ramus of the pubes to the inner side of the crural ring. The other trunk goes to the upper anterior aspect of the bladder, crosses one of the glands called by Waldeyer-Gerota "anterior vesical glands," curves then to the left, and ends in the hypogastric glands. The succeeding lymphatic vessel has no communication with the channels situated along the dorsal vein: it arises exclusively from the urethral system. At the edge of the trigonum it perforates the lateral bladder wall, passes a small gland resting on the bladder, and arrives at the iliac vessels, which it follows.

These anatomical details explain the possibility of the clinical features quoted above. It is an established fact that there are

numerous lymphatics of the penis which skip the inguinal glands and empty into those of the pelvis, a large proportion of which are situated at a point quite remote from the original lesion. As the lymphatics of the foreskin communicate with those of the glans, and these in turn with those of the urethra, in every form of penile cancer, no matter where its origin, there is a possibility that one of these channels above described may serve to disseminate the disease.

These observations have perhaps less influence on therapy than on prognosis. This latter is in general fairly good; as, for example, in fifty-eight cases in Brun's clinic, there were 59½ per cent. cures of from three to twenty-nine years' standing.—*Verhandlungen der deutschen Gesellschaft für Chirurgie, XXVIII Kongress.*

CHARLES L. GIBSON (New York).

REVIEWS OF BOOKS.

IMPERATIVE SURGERY, FOR THE GENERAL PRACTITIONER, THE SPECIALIST, AND THE RECENT GRADUATE. BY HOWARD LILIENTHAL, M.D. New York: The Macmillan Company, 1900.

This alarming title is attached to a modest, neatly gotten up volume of four hundred octavo pages, printed upon supercalendered paper and illustrated with many excellent and original pictures. The author says, "The practitioner of general medicine who rarely takes up the scalpel, the specialist whose path seldom leads him to the operating-room, and the recent graduate who, though versed in the lore of the books and lectures, has seen but little surgery at close range, are those for whom this work has been prepared. It deals only with the diagnosis and treatment of conditions which demand immediate operative measures; and it presupposes the absence of an experienced surgeon and the impossibility or inexpediency of removing the patient or of waiting for expert assistance."

The effort of the author, therefore, is to tell a tyro what to do when he stands in the presence of a grave surgical emergency,—how to extemporize retractors out of table-spoons, eating-forks, and hair-pins; and how to introduce into his armamentarium potato-cutters, gas-pliers, carpenters' saws, butchers' saws, scroll-saws, pocket-knives, and darning-needles. He begins by giving one the impression that he is writing a surgical guide for the use of mates of sailing vessels or for gang-bosses in lumber camps. There is a codicil to the author's preface which reads like the last will and testament of a benevolent old gentleman in ill health.

If the intention is to instruct those who are ignorant in surgery and who harbor an ambition to learn the subject, then the book fails in its purpose, for they should be taught the complete and perfect art. No imperfect surgery should be countenanced; no easy road to major surgery should be pointed out. If the intention is to instruct those who are ignorant in surgery, and who do not propose to learn the subject, but would use the book as a guide when an emergency arises, then it never should have been written, for its little knowledge will prove a dangerous thing. It will encourage amateur surgery; and if the surgery must be done, and will be done, it had better be taken from the ordinary text-book intended for the real surgeon and interlarded with the fundamental principles of the art. Moreover, it is too brief to be a safe rule and guide. The resources of its therapy are too limited. It passes too quickly from conservative and palliative measures to radical operation. The author would have his amateur lopping off legs and arms as though that were, indeed, the chief end of imperative surgery.

When we come to consider the value of this book, not for the inexperienced, for whom the author has intended it, but for the professed surgeon of some experience, we find that it has much to recommend it. The surgeon will find that it contains many valuable practical points and helpful expedients. The general surgical principles which it lays down are quite invariably sound; and the evidences of the author's mastery of the technique of surgery are seen on every page. It is of particular value for the hints which it contains, which will be of help to the surgeon when operating outside of the circle of complete operating-room facilities. It is eminently practical; and no surgeon can read it without obtaining instruction. It is founded on good surgery.

The author does progressive surgery a service in pointing out and insisting that many of the major operations can be done under local anæsthesia. Concerning gastrotomy for œsophageal

obstruction, the author makes the very practical statement that local anæsthesia is indicated because of the additional danger of the inhalation, of the excess of mucus excited by chloroform or ether, which, because of the obstruction, cannot be swallowed.

The illustrations are excellent. The index is complete; and the whole is a handsome example of book-making.

NEWTON JAMES.

LA SUTURE INTESTINALE. Histoire des Différents Procédés d'Enterorrhaphie. Par FELIX TERRIER, Professeur de Médecine Opératoire a la Faculté de Médecine, etc., et MARCEL BAUDOUIN, Préparateur du Cours de Médecine Opératoire a la Faculté, etc. Paris: Institut de Bibliographie Scientifique, 1898.

Under title of Intestinal Suture, Messieurs Terrier and Baudouin have prepared a volume of 415 pages of a somewhat novel, very interesting, and peculiarly valuable sort. Restricting their researches as the title indicates, they have with infinite labor gotten together a very large number of monographs, pamphlets, magazine, and text-book articles, complete so far as possible up to September, 1898, and going back to the scanty medical literature of the early Sanscrit. Reducing this mass to order, they have developed chronologically the growth of attempts at reuniting intestinal wounds from the primitive efforts of the early Indian and Arabian surgeons, who persuaded large black ants to close the wound with their powerful mandibles, and rewarded their efforts by tweaking off their bodies, so as to prevent a change of mind; through the successive employment of waxed silk left long and unknotted, so as to be withdrawn through the abdominal opening; of the artificial anus; of buried sutures; of unaided anastomosis; up to the epoch of mechanical approximation contrivances of which Murphy's button stands as the type. It is not the purpose of this brief notice to review or to criticise in detail the work under consideration, but rather to record its

chief features, pointing out, if possible, in what its value to surgery lies.

The first section, some 330 pages, comprises, as already mentioned, a brief illustrated description of almost all known methods of intestinal suture, the latter word being understood in its broadest sense. The arrangement is chronological, the account of each procedure comprising a careful summary of technique, and a description of the special instruments and material employed, together with, in almost all instances, an illustrative plate. It is proper at this point to recall what the authors insist on in their preface, namely, the difficulty of conveying by mere verbal description an accurate conception of even simple surgical procedures, and the necessity of clear and accurate illustrations. They call attention to the pains they have taken to provide photogravure copies of all obtainable original plates, while, where such are lacking, they offer specially prepared diagrams. The vast number of operative procedures on the intestine, many only modifications, is astonishing to one who has given no special thought to the subject, an instance in point being the number of implements similar to Murphy's button, of which no less than nineteen are figured! The prominence given to the work of Senn, Murphy, Abbe, and others cannot but be particularly pleasing to American readers.

A further section furnishes a synopsis arranged with reference to the nature of the operation,—a sort of rational topical method, of especial value for ready reference. This arrangement includes, for example, under the general heading of "Sutures Properly So-called," five sub-titles, under the first of which the various forms of artificial anus are collected, the individual operation appearing in its natural order of development by name, date, and author's name, with a number referring to its appropriate illustration in the text. Five such sections with their sub-topics cover the entire available literature on intestinal sutures.

The bibliography is presented in like methodical fashion,

first by years, then by methods, then by authors. It is peculiarly complete. A table of contents; an alphabetical list of authors, giving the pages where reference to their work may be found, and comprising over five hundred names; an index of contents and one of illustrations complete the volume.

It would seem that this book should be of great utility, not only to the general surgeon and those whose special work leads them more particularly into intestinal surgery, but also to the student who is desirous of obtaining information without the necessity of wading through a long list of volumes, with possible disappointment after all. Its value as a reference work cannot be doubted, for which reason a translation should be welcomed, that the book may be made generally available.

HENRY GOODWIN WEBSTER.

DIE KRANKHEITEN DER NÄGEL. By DR. JULIUS HELLER, Berlin. Pp. 274. Five photogravure plates and 65 illustrations in text. Berlin, 1900. August Hirschwald.

The casual contributions on affections of the nails that have appeared in current literature have found a grateful recognition in the author of this monograph. These, incorporated with the personal experiences of the author, gathered at the skin clinic of the late Professor Lewin of Berlin, have been grouped and classified so as to offer in this volume a veritable cyclopædia on affections of the nails.

Though written by a dermatologist, the medical and surgical aspects have received equal attention, and a study of these pages is soon convincing that the nails, too, are the seat of all the ills that other human flesh is heir to.

The painstaking labor of the author is still further exemplified in the histological changes rendered throughout these pages. Numerous instructive illustrations add to the completeness of the treatise.

An explicit reference to the varied topics handled must needs be foreign to this review. In passing, attention is drawn to the chapters of surgical interest, viz., ingrown toe-nail; perhaps deficient in regard to many of the operations advocated, but none the less offering good surgical advice. Syphilitic onychia; herein a very valuable clinical feature is portrayed, the existence of which is as circumstantial evidence of the same nature as any of the Hutchinson triad. The diabetic affections quite naturally afford a sparse recounting; on the other hand, neurotrophic disturbances are learnedly dwelt upon. New growths of the ungual phalanx complete the list of surgical affections.

By these generalities, the most that can be said in the review of a work of an encyclopædic character, we have aimed to direct the attention of the dermatologist, surgeon, and physician to a book which bids fair to become classic.

MARTIN W. WARE.

UEBER GANGRAEN BEI DIABETES MELLITUS. By DR. FRITZ GROSSMAN, Berlin. Pages 134. Octavo. Berlin. 1900. August Hirschwald.

After a perusal of this monograph, it is evident why the author has titled his work Gangrene in Diabetes Mellitus instead of Diabetic Gangrene. His main contention, the undercurrent of this brochure, is, that Diabetic Gangrene *sui generis* does not exist. Partaking, also, of the nature of a critique, this volume offers a complete survey of the literature.

The opening chapter is devoted to the theoretical considerations of the influence of sugar (glucose) on bacterial growth, in connection with which the experiments of Bujwid showing the synergistic action of sugar in nutrient culture media and in the body of the experiment animal are subscribed to with that modification emphasized by Theobald Smith, of Boston.

Based on the latter's observation, that 3 per cent. sugar constitutes an optimum as an ingredient of media favoring bacterial growth, the author narrates his experiments on animals

subjected to inoculations with these glucosized cultures, and animals artificially rendered glycosuric. In either instance suppurative conditions supervened where they failed when ordinary cultures were employed.

The clinical aspects are then treated under the headings, Furuncle, Carbuncle, Dermatitis, Ulcerations, etc., in each instance prefaced by excerpts from published accounts. The chapter on Mal Perforant is particularly noteworthy and replete with much evidence that tends to confirm the view that this malady is not a neuropathic entity.

Gangrene is considered as either non-inflammatory (spontaneous) or inflammatory. The former the author regards as an accidental occurrence, and the latter, thoroughly harmonizes with laboratory experiments. Gangrene of the lung and other internal organs, among the rarest affections, is liberally dwelt upon.

A consideration of the bacterial fauna shows the staphylococcus to head the list, other bacteria simply acting as symbiotic, and enhancing the ravages of tissues whose immunity is already lowered by the presence of sugar coupled with the pathological vascular and nervous conditions so often associated with diabetes. In this connection neuritis and arteriosclerosis are passed in review. To the latter is assigned the chief cause of gangrene amplified by the diabetic status. Whereas much of the literature collected in support of this subject antedates the antiseptic era cannot be available for the control of bacteriological studies, it serves its purpose to show that only timely operative interference offers chances of recovery. Antiseptics are commended only with a view to converting a moist gangrene into a dry one. Upon the appearance of a line of demarcation, high amputation is favored. Some exceptional instances may permit individualization (Koenig). The author thinks that the use of local anæsthesia and digital compression instead of a constrictor may better the operative results.

The observations of Smith seem to have been the guiding spirit that prompted the author's investigation resulting in this thoroughly readable volume, abounding in much more practical information, diagnostic as well as therapeutic, than can be offered in this review.

MARTIN W. WARE.

PROGRESSIVE MEDICINE. Edited by HOBART AMORY HARE, M.D.
Vol. IV. December, 1899. Lea Brothers & Co., 1899.

This excellent number sustains the character of the preceding volumes of this work. The fourth volume completes the first year, and we take this occasion to congratulate Dr. Hare upon the success of this addition to high-class medical literature. Surgical subjects are treated of in the chapter on diseases of the digestive tract and allied organs; in the chapter on genito-urinary diseases in the male; in the chapter on fractures, dislocations, amputations, surgery of the extremities, and orthopædies; and in a chapter devoted to anatomy.

Under the subject of cancer of the stomach, attention is called to the fact that tumor of the pylorus may be found in almost any part of the abdomen. The most recent views concerning this disease are reported from many sources. A most interesting study of appendicitis is the *résumé* of 1400 fatal cases collected by Mitchell, who believes that the general professional opinion has gone to the extreme in assuring that foreign bodies are not an etiological factor of considerable importance in this disease. In seven per cent. of the fatal cases collected by him, true foreign bodies, aside from faecal concretions, were found.

The recent literature on the surgery of the pancreas adds some very helpful knowledge to this subject. The researches of Paul Carnot are of especial importance. "A. Cipriani mentions the following as the criteria of stone in the pancreatic duct, namely, glycosuria, steatorrhœa, sialorrhœa, general malaise, vomiting, and emaciation, together with the presence of calculi in the fæces, with deep-seated pain along the costal border which

radiates to the spine and left scapula. To this should be added the thirst and increase in appetite, and the fact that on analysis the calculus is shown to be composed of phosphate of lime." This gives one an idea of the admirable manner of criticism employed in this work.

The error of considering the terms chronic gonorrhœa and gleet as synonymous is demonstrated by the contributions on these subjects. There are also presented some new views on the subject of cystitis, and particularly concerning the relation of the bacillus coli to the disease. This bacterium is assigned to a relatively insignificant place as a cystitis producer by Rovsing. Treatment with silver nitrate solution is not only of the greatest therapeutic value, he claims, but is of high diagnostic importance. The French school is adding rapidly to our knowledge of this subject.

The detection of renal calculi by the X-ray has become a diagnostic necessity. There are on record up to the present time thirty-one cases of this kind. The diagnosis of this condition has heretofore been a deduction from symptoms surrounded always by much uncertainty. Henry Morris has incised the kidney over forty times for stone, whose existence seemed indicated by the symptoms, without finding the calculus. Positive diagnosis may be made by the use of the Röntgen ray. The "permanent iodoform dressing of the bladder" described by Bazy is ingenious.

The latest views of the subject of rubber gloves still show much in their favor. A most valuable discussion is that upon the gas bacillus, embodying reports of twenty-two cases of infection with this organism. Reports of Wright's isolation of the specific cause of madura foot are presented. Among other valuable reports and *résumés* are those concerning osteoplastic amputations, traumatic gangrene from rupture of the inner arterial coats, tuberculosis of bones and joints, treatment of arthritis with superheated air, subluxations of the semilunar cartilages of the knee, benign and malignant tumors of bone, and

coxa vera. Koenig's recent contributions to the subjects of tumors of bone are of much importance, particularly concerning the slight malignancy of certain round-cell sarcomata. Karewski reports a case of giant-cell sarcoma of the upper end of the tibia cured by curetting and chiselling, and Koenig has cured the same disease with the sharp curette. These are reports of extreme importance in view of the fact that these cases have heretofore been subjected to amputation of the thigh.

The great value of this work lies in the fine discernment exhibited by the editor in culling from modern current literature things of value and subjecting them to critical analysis of a high scientific order. In selecting his collaborators the editor has chosen wisely. However well the physician may be able to dispense with this work, it contains so much of surgical importance that the surgeon cannot well afford to deprive himself of its help.

JAMES P. WARBASSE.

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